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The American Journal of Obstetrics and Gynecology

VOL. VII ST. LOUIS, MAY, 1924 No. 5

Original Communications

ENDOMETRIAL TISSUE IN THE OVARY*

BY OTTO H. SCHWARZ, M.D., AND ROBERT CROSSEN, A.B.,
ST. LOUIS, MO.

THE presence of endometrial tissue in the ovary was regarded as a condition of unusual rarity until the recent work of Sampson appeared. Up to the time of his publication in the *Archives of Surgery* in November, 1921, there were less than twenty cases of this type reported in the literature. W. W. Russell was the first to report a case in 1899 while Pick in 1905 in Germany described four cases of his own and mentioned four others including Russell's in the literature. Koch in 1911 reported a case associated with the presence of so-called psammoma bodies in the ovary. The finding of these calcified areas associated with this lesion has been noted by us in the present work and we will comment on its significance later. Additional cases were reported in 1919 by Norris, Cullen, Casler and Schwarz. Since the publication of Sampson's first article, in the autumn number of the *British Journal of Obstetrics and Gynecology*, 1922 there appeared three articles by Blair Bell, Donald and Shaw, respectively. These articles collectively described seven cases. The latter two authors discussed the association of the lesion of adenomyoma of the rectovaginal septum as was previously pointed out in Sampson's first publication. Bell and Shaw both emphasized the fact that the condition has been overlooked because in the later stages of the lesion the epithelium is lost and the tissue therefore cannot be identified definitely as endometrial in structure. Bell is inclined to believe it to be

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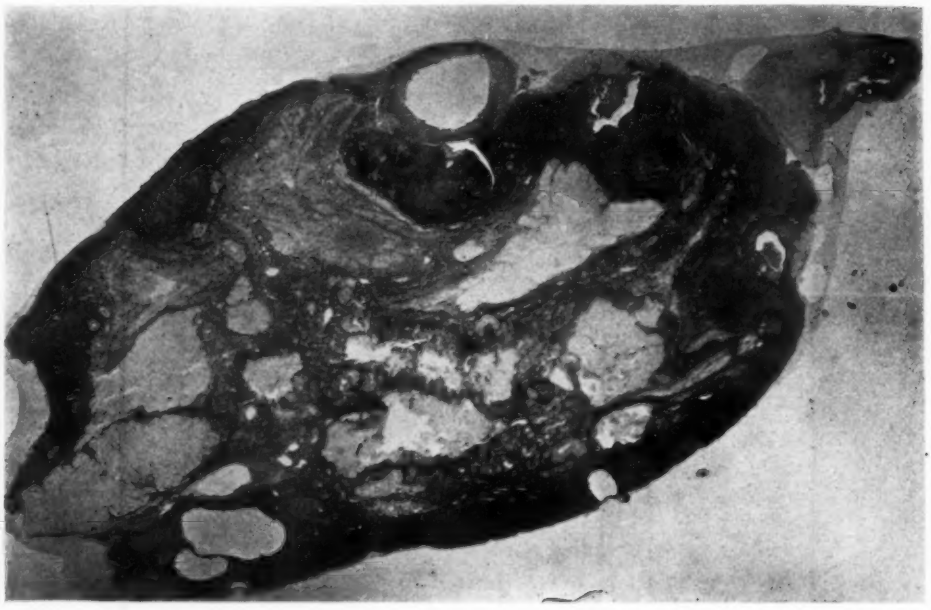

Fig. 1.—Path. No. 1624. Low power of cross section of entire ovary. In the left middle portion of the picture is seen a small hematoma 5 mm. in diameter superficially placed and having no deep connection with the ovary. Immediately above is seen a cavity filled with blood and lined by typical endometrial tissue. A similar cavity is found in the extreme upper and middle portion of the ovary. Note the adhesion in the upper left portion of the ovary. This adhesion contained much blood, stromal cells and gland tissue. The superficial nature of this lesion can be seen by the fact that it is well without the ovarian cortex in all places. This ovary was practically of normal size and was covered with definite adhesions.

Fig 2.—Path. No. 1624. Shows the characteristic endometrial lining of cavity. The lumen contains some clotted blood. This cavity is situated outside the ovarian cortex.

a congenital aberration rather than a metaplasia or cellular spill. Shaw feels with Sampson that the association of "tarry cysts," as the Englishmen called them, shall prove to be of frequent occurrence. Janney, of Boston, in February, 1922, reported two cases of his own and discussed at great length a congenital theory as regards the origin of the lesion and associated this theory with a very thorough embryological study. He mentioned at the end of this article the appearance of Sampson's work and stated that this would lead one to believe that the lesion was rather frequent. In November, 1922, Sampson's most important article appeared. This paper dealt chiefly with the lesion in the ovary in its earlier stages in contrast to the first article which described chiefly the later stages of the disease. The points emphasized by Sampson in this article need careful study and only in this way can the full value of Sampson's great contribution be appreciated. In this publication he mentions that he encountered the lesion in the ovary in a period of a year from May 1, 1921, to May 1, 1922, in forty-three cases in 170 abdominal operations.

After hastily reading this article, we consulted our files and began looking over old sections, and in going over several hundred slides we encountered several interesting lesions in this chance way. This convinced us definitely that the lesion must be quite frequent but we questioned whether these lesions were originally transplants resulting from the escape of epithelium or uterine mucosa from or through the fimbriated end of the tube. We also were much interested in the description of the life history of these lesions and we feel from our present study that we shall be able to demonstrate the correctness of Sampson's views as regards particularly the later changes in these hematomas. We had previously regarded the lesion as having its beginning from the germinal epithelium and the underlying connective tissue and were of the opinion that on account of the close relationship of the tissues involved it was not unreasonable to assume that under certain stimulation such a metaplasia could occur.

Unfortunately, we have been unable to study the pathological lesion at its best, that is, as it occurred in the abdomen at the time of operation. The material which we studied was all from specimens that had been fixed and handled more or less repeatedly and which in many instances had been mutilated by previous sectioning. Further, the operators who were responsible for the removal of the material we are sure in a large percentage of cases did not remove the ovary on account of this particular lesion and perhaps did not remove ovaries the appearance of which might suggest the lesion. We, therefore, could not hope to find the lesion with the same degree of frequency that Sampson did in his original publication. We felt, however, that if we were able to find it in any degree of frequency we would be able

Fig. 3.—Low power hematoma mentioned in Fig. 1. Epithelial lining is not present in this lesion but the wall contains much old blood pigment, connective tissue cells and large mononuclear wandering cells.

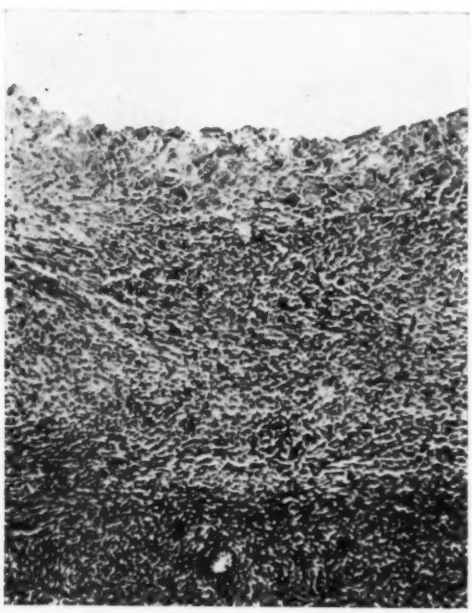

Fig. 4.—High power of Fig. 3 showing structure of the wall.

to study the various types of the lesion in sufficient number and be able, therefore, to comment on their characteristics.

Before taking up the study of our series, we shall briefly mention some of the more important points which Sampson has emphasized. He believes that the lesion occurs as the result of the escape of uterine mucosa or tube epithelium from the fimbriated end of the tube. The most frequent location where this material becomes implanted is the under and lateral surfaces of the ovary. He states his reason for this location by reason of the fact that the fimbriated end of the tube in most instances is in close connection with these areas. He mentions the culdesac as the second most frequent site and describes the implants there as primary, or secondary to a ruptured perforating endometrial cyst of the ovary. He describes hematomas of two types, namely, superficial and deep as they are situated on the surface or deep in the cortex of the ovary. The superficial hematomas are small, rarely larger than 5 mm. in diameter, frequently no larger than 1 mm. to 3 mm. in diameter. They are usually multiple and can be found in various stages of their development and retrogression. They are lined by epithelium similar to the uterine or tubular epithelium with or without stroma and almost always associated with hemorrhage in the underlying tissue. These structures may rupture and discharge their epithelial lining; if this occurs, the life of the cyst is ended and retrogression takes place. If the lining of the cyst is only cast off in part, then the cyst may close and reform and the perforation may be repeated. The perforation with its discharge of endometrial tissue frequently leads to secondary transplantation on the pelvic peritoneum, the rectal, sigmoid and other structures, most frequently, however, in the culdesac.

Sampson describes the deep hematomas as arising from glands or tubules which have reached the deeper structure of the ovary and a hematoma of this type may in time perforate and when it does it may be of considerable size, several centimeters in diameter, 9 cm. we believe is the largest he describes. The hematoma, however, may increase so slowly in size that it may never rupture and ceases to grow after the menopause. Further, the epithelial lining of the hematoma may be completely cast off as the repeated reactions of menstruation and the life of the hematoma ceases, and if small may be completely absorbed. A most interesting reaction takes place in the tissue surrounding these hematomas. We take it that this description applies chiefly to those hematomas which do not rupture. As a result of the repeated reaction of menstruation, the blood accumulates in the cavity of these hemorrhagic cysts, and as there is no avenue of escape, some of it remains in the surrounding tissue. The blood disintegrates, resulting in a diffusion of blood pigment throughout the wall, which

Fig. 5.—Cross section of the ovary. The upper margin of the ovary can be seen as a lighter area just underneath the darker tissue. The larger area of dark stained tissue perforated by glands and showing a considerable cavity is a large endometrial mass superficially placed on the ovary. The ovary in this case measured 4 x 3½ x 1½ cm. and was made up chiefly of a collapsed cavity which had a yellow pigmented lining. We take it that the large cavity shown in the picture represents the above described lesion. The gross specimen in this case was not available.

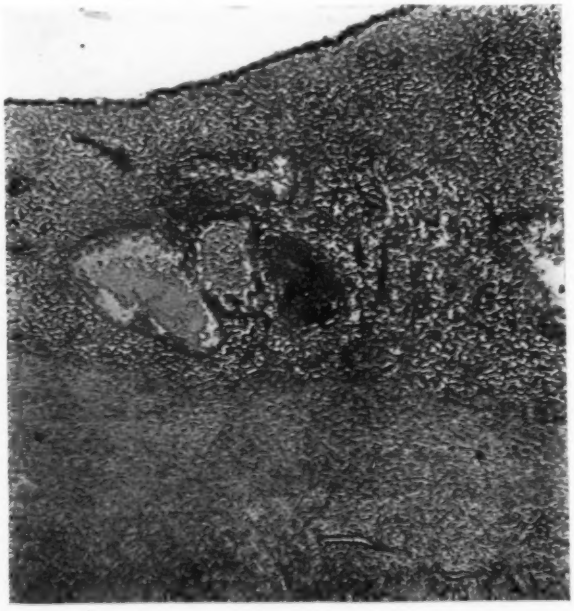

Fig. 6.—High power of Fig. 5, showing lining of the cavity made up of a thick layer of stromal tissue in which the stroma cells were markedly swollen and the gland cells high in character and active. Structure appears edematous and contains blood in the stroma and in the gland lumen. The history was unavailable in this case but we take it that menstruation was about to begin.

in turn is taken up by large mononuclear wandering cells which appear in large numbers and comprise the chief portion of the wall at this stage. Sampson refers to these cells as the endothelial leucocytes.

It may be well to mention here that in Sampson's first article he states that these cysts may be endometrial at the start or a hematoma arising from ruptured or atretic follicles possibly following ovulation or from an abnormal corpus luteum due to the invasion of epithelial tissue. He mentions that both Runge and Wolfe have demonstrated epithelization of ovarian hematomas by the invasion of the surface epithelium. These linings are described as low cuboidal and columnar in type and Sampson states that if due to the invasion of the surface epithelium a definite metaplasia must take place which makes the tissue appear to resemble the normal endometrium. Sampson in his conclusions mentions as the site of the development of these cysts the ruptured graafian follicle in which the endometrial tissue may have become implanted. In his last article in which he deals with the lesion chiefly in its earliest stage, he does not emphasize this as a frequent location merely mentioning the surface or cortex of the ovary as the site. We may say here that we have encountered four cases in which in the center of the corpus albicans there were present numerous gland tubules which were similar to uterine or tubule epithelium. In one instance there is a definite lining with the remains of old blood in the underlying tissue. These cases will be illustrated and further comments will be made in the accompanying legends. It is interesting to mention while commenting on the peculiar lining of these old endometrial cysts that Novak although he illustrates beautifully certain types of ovarian hematomas, namely, the follicular, the corpus luteum and stromal types, does not describe a lesion with a picture similar to those of the old endometrial cysts whose wall is so studded with the large mononuclear wandering cells.

Our study consisted of the examination of 420 ovaries. Of these 256 specimens were taken from the files from which no gross specimens were available. In these cases in many instances only one section could be studied but in the remaining 164 cases numerous blocks were taken from one or both ovaries whenever we found, as we termed it, a suspicious area. As we have previously mentioned, under these circumstances we could by no means hope to find the lesion in the same degree of frequency that Sampson did, but felt that we might find the lesion in some degree of frequency sufficiently great to study the lesion in all of its stages. We decided to class into groups as follows:

In the first class were the superficial lesions which definitely contain endometrial glands and stroma and cysts lined with endometrium. Second, the hematomas of endometrial type. Third, ovaries with ad-

Fig. 7.—High power of Fig. 5, showing the relation of the stroma to the underlying ovarian tissue and the swollen character of the cells in this case.

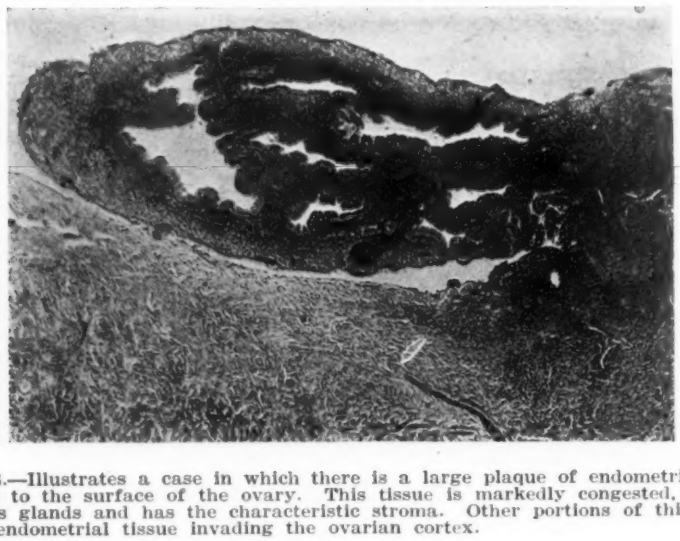

Fig. 8.—Illustrates a case in which there is a large plaque of endometrial tissue adherent to the surface of the ovary. This tissue is markedly congested, contains numerous glands and has the characteristic stroma. Other portions of this section showed endometrial tissue invading the ovarian cortex.

hesions in which the adhesion consisted of blood, stromal tissue and occasionally included glands. Fourth, lesions in which there were numerous tubules in which there was no definite accompanying stroma. It may be stated in making this classification numerous specimens were discarded which could possibly have been placed in either group two or group four and some even in the first group, but we felt that the inclusion of these suggestive cases would warrant additional explanation and, therefore, add confusion. In the first group there were fifteen cases, in the second group there were eleven cases, in the third group there were eleven cases and in the fourth group there were eighteen. We feel that the cases described in groups one and two are absolutely of endometrial origin. In the third a large percentage of them can be considered transplants without any hesitancy. Whereas in group four the origin of the tubules must be considered before classification here would be definitely possible.

In the group of 164 cases in which the gross specimen could be studied more or less intact, there were eleven cases with endometrial tissue and seven with hematomas of the endometrial type showing a total of eighteen cases for this group. In studying the sections from the cases in which the gross specimens were not available, five cases with true endometrial tissue were encountered and four of the hematoma type. This shows very clearly a very much higher percentage of cases for the series in which the gross specimens were studied.

In the first group were placed those cases in which the endometrial tissue was found on the surface of the ovary, in the cortex of the ovary or lining a cyst. These cases represented chiefly cases in which the endometrial tissue was limited to the surface of the ovary or involving only a very superficial portion of the cortex. The cavities connected with these cases were all very small and appeared to have either a direct connection with the surface or connected themselves with the surface by perforation. The endometrial structure in these cases was very well developed, the stroma quite characteristic and the glands very clear cut. There were four cases in which the endometrial tissue was found lining a cyst. These cysts were in each case of fair size, the smallest being 2½ cm. in diameter and the largest 10 cm. in diameter. In each instance these cysts were lined by an epithelium which was similar to the endometrium and an occasional gland was found below the lining epithelium. The underlying tissue showed a definite stroma which was markedly congested and which showed the presence of blood pigment both microscopically and in the gross. In the gross these walls have a characteristic dirty, yellowish brown color with a comparatively smooth lining. In the wall one finds in addition to the stroma cells large wandering cells which are one of the chief characteristics of the

hematoma type of this lesion in absence of the epithelium. Another feature of the lining is the connection of these cysts with the adjacent tissue. The line of demarcation between the tissue of the cyst wall and the ovarian substance can be readily distinguished. Although these cysts were found in the collapsed state, frequently there

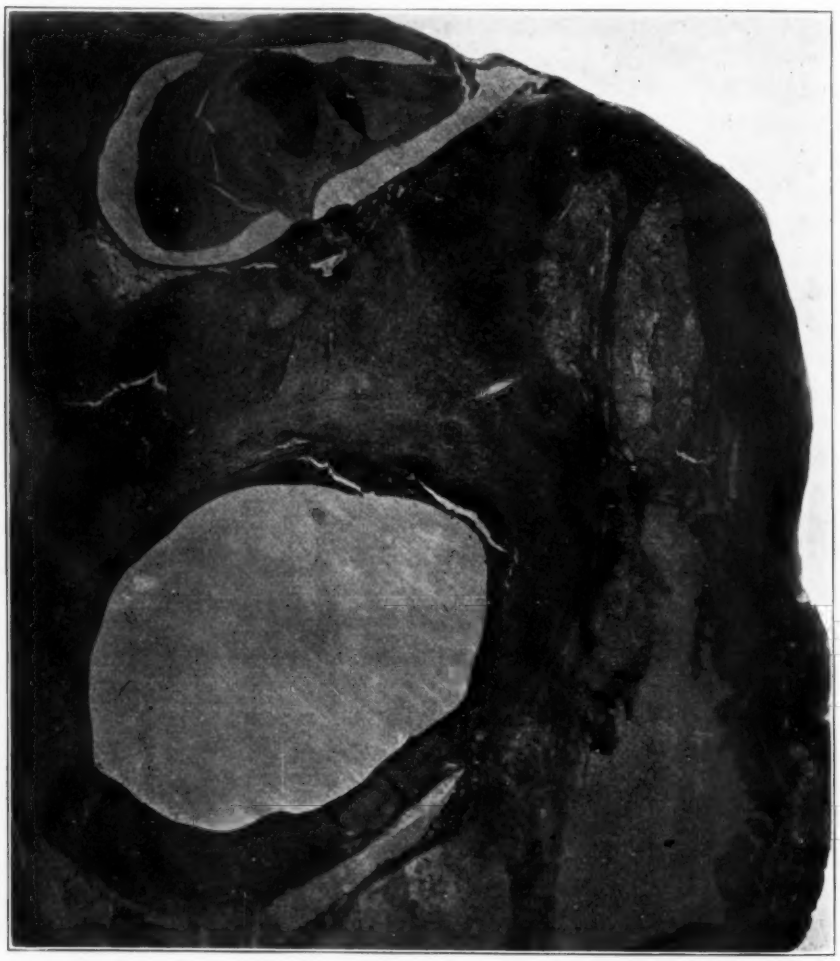

Fig. 9.—Path. No. 793. This is a picture illustrating two endometrial cavities in the ovary. This case was reported by one of us previously. The cavities are superficially placed in the ovary and have literally pushed the cortex of the ovary ahead of them. Note that typical gland tissue is seen only in two areas, the remainder of the cavities being lined by a single layer of epithelium and stroma cells. The ovary in this case was about the size of a hen's egg. The cavities were not larger than three-fourths of a centimeter to one centimeter in diameter.

is a definite line of separation. The description made at the time when they were first received in the laboratory showed all of them to be filled with clotted blood. In one instance a definite perforation was found around which there was an area about 1 cm. in diameter covered with old blood and having a ragged appearance. The size

of the perforation was about 3 mm. in diameter. This was in a comparatively small cyst 2½ cm. in diameter. The study of these specimens rather definitely brings out their close association with the surface of the ovary and in illustrating this group it is one of the chief points we wish to emphasize particularly. In a word, the endometrial tissue appears on the surface of the ovary in such a way that it appears to be glued on and gives the impression that it only reaches a deeper situation after it has been present on the ovary for some considerable time.

In the second group, the group of hematomas we believe to be of endometrial origin, there were eleven cases. This group was most interesting because the structure of the wall in these cases is very characteristic and Sampson's descriptions are absolutely correct in this regard. We had unusual opportunity to study the character of such a hematoma because we found one in association with a case of real endometrial tissue, a case placed in the first group. This case is represented in our illustrations and it shows a comparatively small ovary upon which there is ingrafted definite endometrial tissue associated with this superficial hematoma. The hematoma is placed on the top of the surface of the ovary and is not in any way connected with the deeper structure. Its wall is unusually round and colored a yellowish brown. Its lumen was filled with blood and on histological examination it showed only a blood-stained wall due to the diffusion of blood pigment cells of the connective tissue type and a large number of cells mononuclear in type containing much blood pigment. These cells are the so-called endothelial leucocytes which have been previously mentioned by Sampson. This cavity was small and measured only 5 mm. in diameter. In studying the wall of the hematomas in this group as a whole, the pictures coincide exactly with that which we found in this superficially implanted hematoma. In going through the series a large number of hematomas were encountered, particularly a large number of follicular hematomas as well as numerous corpus luteum cysts. We have never seen this reaction in any way characteristic in these two lesions. In fact, the walls of the corpus luteum cysts are notably free of blood pigment and the lutein cells in more or less state of preservation stand out clearly against the adjacent ovarian tissue. In the stromal hemorrhages one occasionally sees this same reaction, but the irregularity of the lesion and the fact that the condition is never well marked would lead to little confusion with the hematomas that were previously lined by endometrium. Another feature which is quite characteristic is their clear cut demarcation from the surrounding ovarian tissue. The hematomas in this group varied in size from ½ cm. in diameter to 5 cm., several being about 5 cm. in diameter. They all showed in

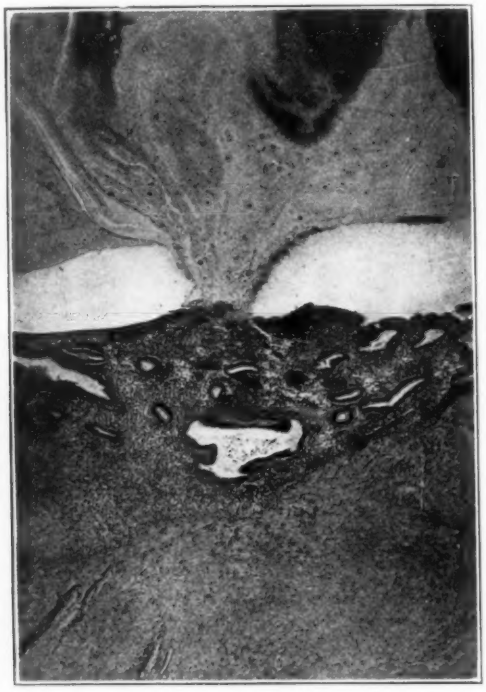

Fig. 10.—High power of the upper cavity in Fig. 9, showing a beautiful pattern of endometrial tissue. Note the tissue immediately below the endometrium. We previously described this as muscle tissue. We feel now that it is only a hypertrophy of the connective tissue *in situ*.

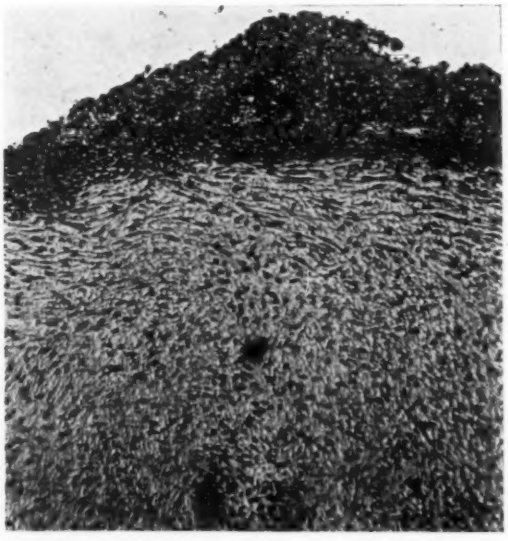

Fig. 11.—Shows superficial implant of stromal tissue on surface of ovary. Case from collection of Dr. George Ives.

part this pigmentation and presence of the wandering cells and several of them very beautifully. In one instance we found definite endometrial epithelium lining one of them. This was in a cyst 2 cm. in diameter which was in the right ovary and the left ovary contained a beautiful example of an endometrial hematoma and was only ¾ of a centimeter in diameter. As we have previously mentioned, Novak in his very well written article on hematomas of the ovary, does not describe a hematoma of this character and as Sampson has previously stated this type of hematoma must be included as an additional entity. It may be stated that in every instance either the gross specimens or in those cases in which the gross specimens were not available there was a description of adhesions and clots about the ovary.

The third group consisted of ovaries which showed no hematoma or tissue of the endometrial type but about which were present adhesions with considerable amount of old blood and adhesions in which the stroma was very cellular, in other words having the appearance of endometrial stroma. Twelve cases were placed in this group. In several instances there was found associated with these adhesions definite epithelial tissue and in five cases there were definite gland tubules found included in the adhesions. In two of these cases in which glands were found, there were associated with them tiny nodules of calcification. We will speak of this condition later. We feel that in this group are included cases in which stromal tissue and gland tissue is in its earliest process of implantation. In some instances these plaques were quite large, as long as ½ cm. and ¼ cm. wide. Usually, however, they were quite small.

The fourth group includes those cases in which gland tubules were found in the ovary in varying number usually well implanted in the cortex. These glands do not in any way resemble the germinal epithelium. They are very high in character and appear more like tube epithelium than the epithelium of the uterine type. They are in some instance surrounded by a definite hemorrhagic area and there is blood within the lumen but this reaction is absent as frequently as it is present. In some instances these gland tubules are seen markedly dilated and containing some red blood cells within their cavity. As we have mentioned, they are most frequently found in the upper ovarian cortex but may be deeper. Glands of similar structure have been found in the superficial epithelium. In one instance a group of five or six such tubules was found implanted on the very superficial portion of the ovary well outside the tunica albuginea. There were four cases in which this glandular epithelium was found well situated in the corpus albicans and it is interesting to note that in two of these cases there was associated with this epithelium true endometrial

tissue in the ovary. Another interesting condition which we met with in one instance was the fact that the fimbriated end of the tube was abnormally adherent to the ovary. Immediately below this attachment and extending for some distance into the ovarian substance were numerous tubules of the type that we have described as characteristic of this group. This picture very strongly suggests the transplant

Fig. 12.—Path. No. 1992. Cross section of ovary. The ovary in this case measured 3½ x 2½ x 1½ cm. In the upper portion of the picture is a follicular cyst. The lower large cavity which is not quite complete is a typical endometrial cyst. Note the dark area running around this cavity quite well seen in numerous places. This is due to hemorrhage underneath the epithelial lining in the compressed stromal tissue. To the left and in the middle of the picture near the periphery are three small cavities. These are lined by epithelium similar to uterine epithelium. The size of the endometrial cyst was 2 x 1½ x 1½ cm., and was lined by a dirty yellowish-brown membrane. There was an irregular surface with adhesions and old blood covering an area about 1 cm., in the center of which there was a distinct perforation 3 mm. in diameter.

theory for this type of lesion as well. We may say here that when the germinal epithelium is associated with adhesions of the vascular type it has a tendency to take on the appearance of the type of cell

in these glands. Although we have seen this change not infrequently, we have never seen any gland formation immediately below it.

As Sampson has described the life history of the hematoma of the endometrial type, we feel that these tubules also undergo characteristic changes which finally obliterate them. We have found in association with these lesions six cases in which there was present a number of small calcified bodies closely associated with the glands. In several instances these calcified areas were very numerous. We have been able to demonstrate that these small calcified bodies have their origin primarily in the lumen of these tubules and our illustrations will bear this out. Two cases were encountered in which these calcified bodies were found in adhesions and in one instance this association with a gland tubule could be demonstrated. It might be said that these lesions occur in comparatively old ovaries, in other words, of the sclerotic type as in most instances there was present comparatively little functional tissue. Calcification in the ovary has been described by several writers and it has been chiefly described as occurring in the corpus albicans. Moskowitz described five cases one of which showed true bone formation. These were associated with the corpus albicans and were all several millimeters in diameter, the largest being a calcarious mass 1.7 x 1.3 x 1 cm. in diameter. Koch in 1911 describes calcified lesions in the ovary and terms them psammoma bodies similar to the psammoma bodies that are described in connection with the central nervous system. He finds these in the ovary associated with the corpus albicans, in neoplasms of the ovary and also in the case of endometrial tissue in the ovary. In this instance he pictures the calcification in the stroma but does not point out any association with the glands although several of the bodies are situated in close relationship to the glands. We feel that this is a method by which these gland tubules are obliterated in the ovary after menopause. It is also interesting that in the corpus albicans we find occasionally this same type of epithelium and although we were not able to demonstrate calcification associated with any of our four cases, we felt that perhaps the calcification that has previously been described in association with the corpus albicans may have their origin in such gland inclusions.

In connection with this paper, we are including two cases which have some bearing on the subject of endometrial tissue in the pelvic cavity as a whole and, therefore, have illustrated them and will include them in this paper. The one case is a fallopian tube in which we believe endometrial stroma could be demonstrated. In this case both adnexa were matted together with dense adhesions the tubes being very much enlarged and the ampulla of one dilated to 2½ cm. This tube was filled with a semisolid chocolate colored material. As

the specimen was presented from outside sources no accompanying history was found. The endometrium shows a marked edema with the presence of blood cells in the stroma and in the gland lumen suggestive that menstruation was about to begin. The section through

Fig. 13.—Higher power of Fig. 12, showing the epithelial lining and showing the obscurity of the structure beneath it, due chiefly to the presence of marked hemorrhage.

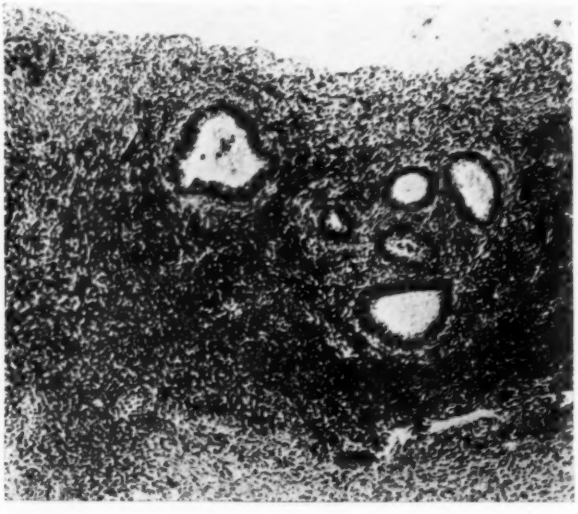

Fig. 14.—Ob. Path. No. 2076. Shows a group of glands invading the superficial portion of the cortex of the ovary. There is a slight hemorrhagic reaction around these tubules but no stroma is present. This is the type of case that was placed in group four.

the dilated tube which contained the chocolate colored material showed a thin-walled tube not more than 3 mm. in diameter in its greatest thickness and everywhere lined by well-developed tube epithelium. This epithelium was unusually high and also there was a definite

increase in cells below the lining; there was little or no evidence of inflammation there being only a small number of small round cells. The wall showed no inflammatory reaction. Throughout the extent of the lining of the tube there was present fresh and old blood very much similar to the lining seen in the hematoma in the endometrial cyst. The picture is very suggestive of tube menstruation and the structure of the tube as a whole has more the appearance of endometrial tissue than that of the tube. In one point in the lining there was found a small area over which the lining epithelium was absent and which appeared definitely as endometrial stroma. We do not know what the nature of this tissue could be if it were not tissue that could be classified as of the endometrium. When we encountered this area we immediately examined the original block and cut numerous sections.. Although these sections showed the same characteristic appearance of the tube, this same plaque of supposed endometrial stroma did not appear in the sections although the large gland immediately below it could be identified. The area above was covered by a layer of epithelium which was absent in the particular section which showed the stromal tissue. We, therefore, felt that if this was endometrial stroma it occupied only a very small area. (Figs. 20 and 21.)

The other case was one in which endometrial tissue was found in the wall of the appendix and the appendix was removed by Dr. Major Seelig for a chronic appendicitis and we have not included any data concerning this case as Dr. Seelig wishes to report the case in full at a later date. The organ in this case was very definitely thickened, markedly adherent and surrounded by old blood. On section the wall was shown to be enormously hypertrophied. The peritoneal surface had been torn and could not be identified, but at the immediate periphery of the specimen one could demonstrate typical endometrial tissue entering the wall. There were numerous islands of endometrial tissue scattered throughout the wall and every section taken, some six or seven, showed this structure very characteristically. One section, which I unfortunately did not illustrate, shows the tissue in connection with the mucosa of the appendix. The muscular tissue of the appendix was markedly hypertrophied and there was a definite scantiness of lymphoid tissue throughout. There was no inflammatory reaction in the appendix, it was comparatively free of anything that suggests even chronic inflammation. We feel that this case is of particular interest on account of the muscle tissue hypertrophy. When Sampson's paper came out describing endometrial transplants in the culdesac associated with hemorrhagic cysts in the ovary, we were struck with the fact that in connection with these lesions there was no description of a markedly hypertrophied muscle tissue.

Fig. 15.—Case No. 33. From collection of Dr. George Ives. This picture shows a cyst with an epithelial lining in the center of a corpus albicans. This case also showed typical endometrial tissue on the surface of the ovary.

Fig. 16.—Surg. Path. No. 4668. Shows an abnormally adherent fimbriated end of the tube to the surface of the ovary. Throughout the left half of the picture can be seen glands in the substance of the ovary. The close connection of these glands with the fimbriated end of the tube is very suggestive that they were derived from the epithelium in contact with the ovary.

The cases described by Cullen in which the pelvis is literally glued together by the lesion always showed a well-developed, smooth, muscle tissue accompanying the endometrial glands and stroma. It can, therefore, be easily explained then in the appendix and if this applies to the appendix it applies elsewhere that in the presence of these penetrating glands the tissue *in situ*, namely, the muscle tissue and connective tissue, undergo marked hypertrophy and in this way the lesion that Sampson has described can be considered an earlier stage of the type of lesion that Cullen has so extensively described. In the case which was reported by me several years ago of endometrial tissue in the ovary, we described the tissue immedi-

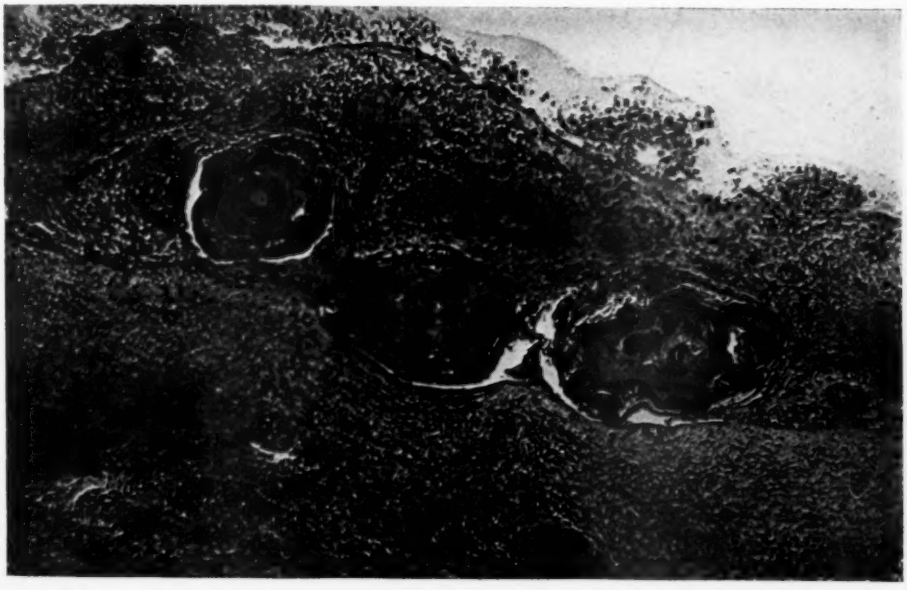

Fig. 17.—Ob. Path. No. 653. Shows three small calcified areas in an adhesion attached to the surface of the ovary. The nodule to the left is lined by typical glandular epithelium.

ately surrounding the cyst as hypertrophied, smooth, muscle tissue. This should be described only as the hypertrophied connective tissue of the ovary immediately surrounding the lesion. Some regard the peculiar stroma of the ovary as smooth muscle, but most texts refer to it as ovarian connective tissue. In its appearance, however, it resembles smooth muscle tissue and stains similar to smooth muscle tissue with Van Gieson's stain. We believe W. W. Russell in the description of his first case in 1899 made a similar description as regards his case. We believe this now to be a hypertrophied ovarian connective tissue which surrounds this lesion and not similar to hyperplastic uterine muscle which surrounds the lesion of so-called diffuse adenomyoma of the uterus.

Since writing the above, our attention has been called to an article by Blair on ovarian hematoma in the September number of *Surgery, Gynecology and Obstetrics*. He refers to an article by J. V. Meigs of Boston who reported in July, 1922, sixteen cases which he collected from the material of Dr. Graves. He enumerates various theories as

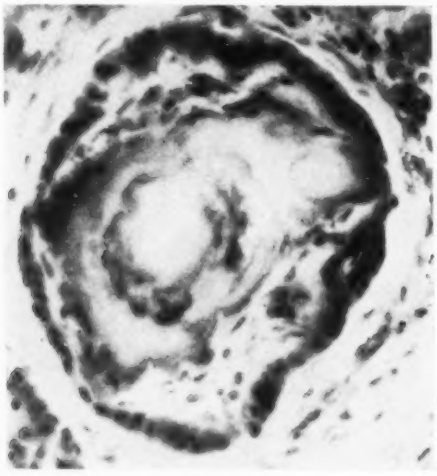

Fig. 18.—High power of nodule to the left in Fig. 17. Shows connective tissue invading the gland lumen and surrounding the calcified area. Note the typical gland structure still remaining.

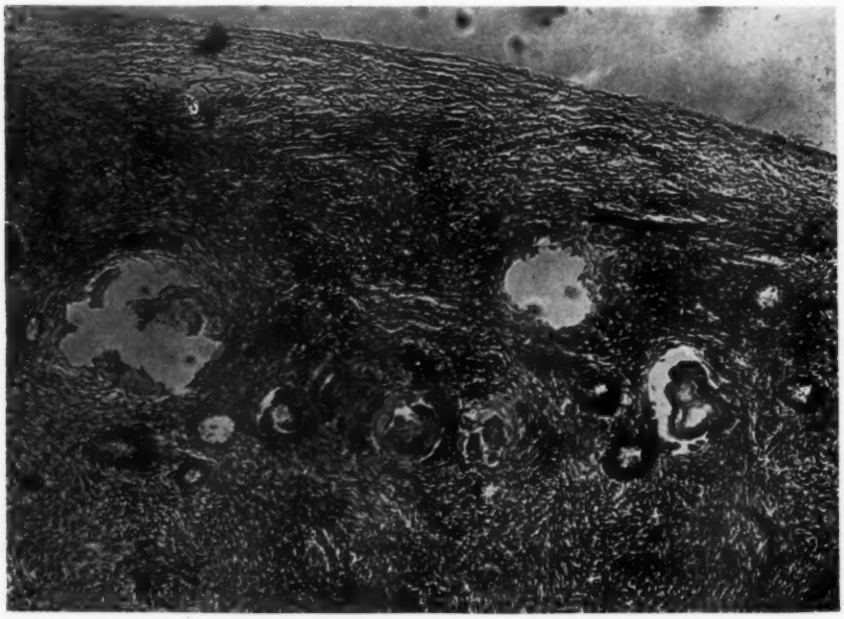

Fig. 19.—No. 1403. One entire surface was literally studded with small gland tubules without stroma. Numerous small areas of calcification are seen in this field associated with the glands. This patient was forty years of age and had never been pregnant. The ovary still contains a fair number of primordial follicles and several developing follicles were seen.

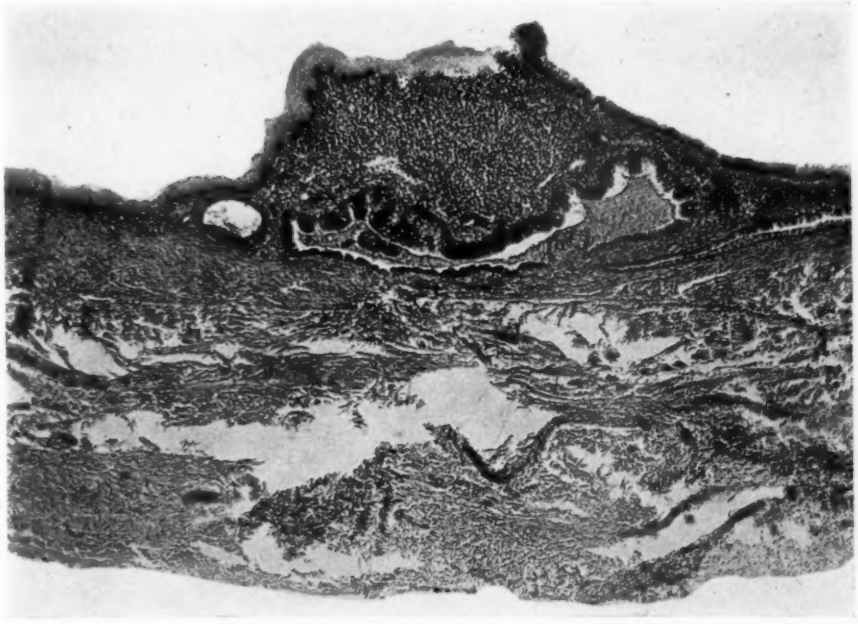

Fig. 20.—No. 1987. Entire tube wall showing plaque of tissue similar to endometrium. Case of hydrosalpinx. Cavity contained some blood. There is blood present throughout the tube under the epithelial lining and the epithelium was high in character; the picture suggested tubal menstruation. Inflammatory cells were not conspicuous in this specimen. There was some round-celled infiltration.

Fig. 21.—High power of Fig. 20, showing an area with the tissue resembling endometrial stroma. The cells are chiefly of connective tissue type, there being a small number of lymphocytes present as well.

regards the origin of these lesions in the ovary and apparently emphasizes that a metaplasia of the germinal epithelium takes place in some instances. The lesions were for the most part of the hematoma variety in which there was definite endometrial tissue. This writer apparently is convinced of the frequency of the lesion. The cases are reported with case histories and microscopic descriptions of the lesions. The diagnosis was in each instance confirmed by Mallory, pathologist of the Boston City Hospital.

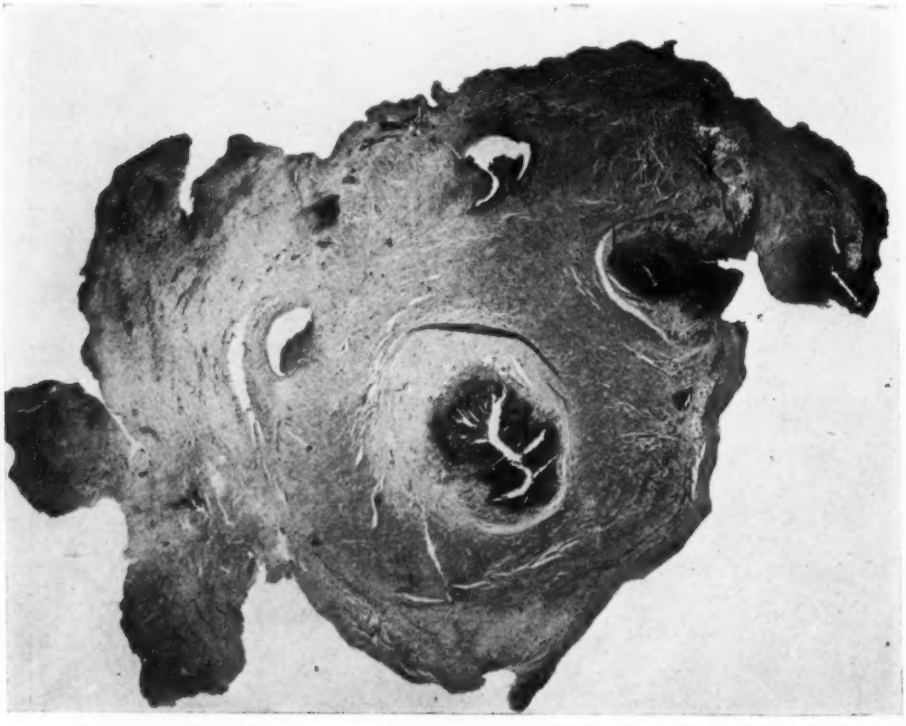

Fig. 22.—Cross section of the appendix. Dr. Seelig's case. The lumen of the appendix is seen near the center of the picture. There is also some lining mucosa seen toward the upper right portion of the picture. This suggests that the appendix was turned just where this section was taken. Note the enormous thickness of the muscle tissue of the wall. The two cavities seen above and to the left of the lumen are lined with endometrial tissue.

We wish to state that we are indebted to Dr. Crossen for the opportunity of studying much of his material in this series. We also wish to thank Dr. George Ives for supplying us with some of his material.

SUMMARY

We feel we have been able to study a sufficient number of cases of endometrial tissue in the ovary to allow us to observe the lesion in most phases of its life history. The frequency with which we encountered the lesion in our series leads us to believe that it is quite

common. However, its real frequency can only be determined by the surgeon who is familiar with the lesion in all its phases and studies his own material while fresh and also microscopically. Under such circumstances Sampson's figures as regards the frequency of the lesion should be duplicated easily. The lesion in the stage which represents a hematoma surrounded by a wall containing old blood, connective tissue cells and large mononuclear wandering cells without any epithelial lining can be easily overlooked. Sampson's picture describing this late stage is very characteristic. We have failed to observe this lesion in connection with definite lutein and follicular

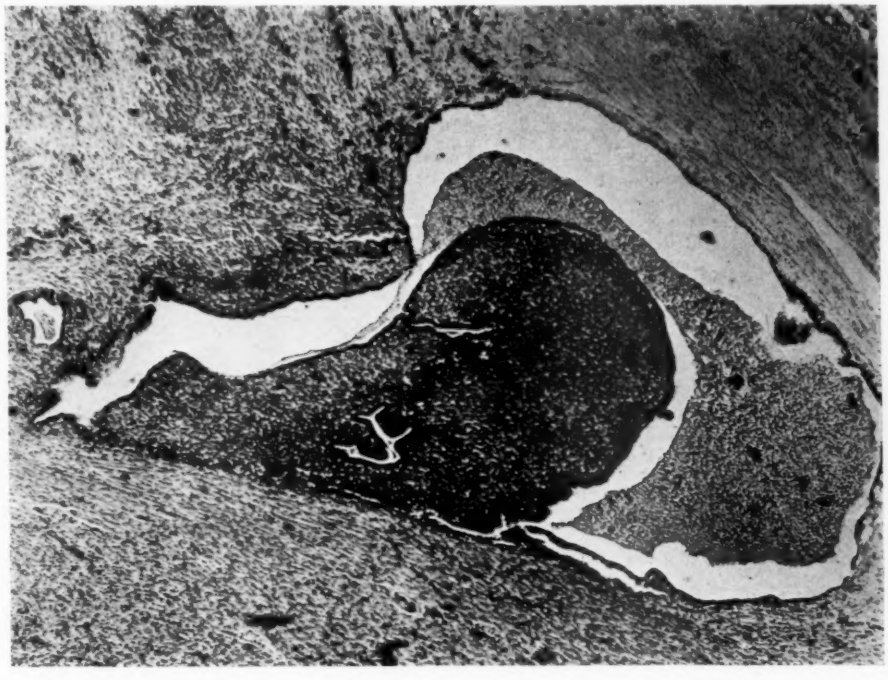

Fig. 23.—A large cavity in the wall of the appendix lined by endometrial tissue and containing a large plug of typical endometrium.

hematomas in various stages although we observed these conditions in considerable numbers in our series. Occasionally there was a somewhat similar appearing lesion in small stromal hemorrhages, but this occurred in a rather irregular manner and never in the same characteristic way in which it was constantly observed in connection with the hematomas supposedly of endometrial origin. The germinal epithelium of the ovary in the presence of adhesions particularly associated with hemorrhage may simulate tube or uterine epithelium. We have observed this frequently but we have not observed the formation of gland tubules beneath such an area nor have we observed any characteristic stroma beneath the germinal epithelium.

We believe that in the case of chronic subinvolution of the uterus with no other lesion present in the wall of the uterus, in the production of the lesion of diffuse adenomyoma of the uterus the glands invade the wall primarily, and that the hyperplasia of the myometrium develops subsequently. That such hyperplasia could occur from glands invading the peritoneal surface is well illustrated by Seelig's case with the lesion in the appendix. Accordingly, we feel that the muscle tissue so well developed in the late stages of adenomyoma of the rectovaginal septum, the type of cases so well described by Cullen, may have its origin in this manner.

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Washington University, School of Medicine.

CARCINOMA OF THE UTERUS*

By George W. Crile, M.D., Cleveland, Ohio

(From The Cleveland Clinic)

PERHAPS there is no field in surgery regarding which there exists a wider diversity of opinion than the treatment of carcinoma of the uterus,—of carcinoma of the cervix particularly. Even before the complex problems presented by carcinoma of the uterus were rendered still more complex by the introduction of treatment by x-ray and by radium, there existed a wide divergence of opinion as to the indications for operation and the type of operation to be performed. Today with the increasing number of advocates of radium and deep x-ray therapy to the exclusion of surgical treatment it becomes imperative for us to examine the evidence presented by the results of various methods of treatment, or of combinations of methods, in the hands of individual operators.

Thus, the American College of Surgeons has attacked as one of its first problems for intensive study the treatment of carcinoma of the cervix; and the uniform presentation of data collected from various clinics covering all phases of incidence, types of tumors, symptoms

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and operability and the results of various methods and combinations of methods of treatment should throw urgently needed light upon this outstanding problem.

A study of the literature for the past two years, in the hope that we might glean therefrom comparative statistics, shows such a divergence of opinion, and such a divergence of plan of presentation of statistics that it is practically impossible to draw any final conclusions. In this presentation, therefore, I shall, in the main, confine myself to a report of preliminary studies of carcinoma of the cervix and the fundus which have come under the observation of my associates and myself. This study is still in progress and the results reported here and the deductions drawn therefrom are to be considered as the results and deductions of the moment which may possibly be altered by our later investigations.

The results of our statistical studies at the present time are given in Table I and the figures therein suggest the following discussions regarding special features:

TABLE I

END-RESULTS—CARCINOMA OF THE UTERUS

	CERVIX		FUNDUS		ALL CASES—FUNDUS AND CERVIX	
Total number of cases		251		106		357
Not treated	31		15		46	
Cases available for study of operability, mortality, etc.		220		91		311
Radical operation	60		70		130	
Palliative operation	108		17		125	
No operation—radium and X-ray only	52		4		56	
Operative deaths—radical operation		4		6		10
Operative mortality—radical operation		6.7%		8.6%		7.7%
Operability (radical operation)		27.3%		76.9%		41.8%
Cases heard from		139		44		189
Radical operation	42		36		84	
Palliative operation	47		5		52	
No operation—radium and X-ray only	50		3		53	
Number of cases surviving 3 years (heard from)		23		14		37
Radical operation	16		12		28	
Palliative operation	4		2		6	
No operation—radium and X-ray only	3		0		3	
Number of cases surviving 5 years (heard from)		17		11		28
Radical operation	14		10		24	
Palliative operation	3		1		4	
Percentage of 3 year survivals—all operations		22.5%		34.1%		25 %
Percentage of 3 year survivals—radical operations		38.1%		33.3%		33.3%
Percentage of 5 year survivals—all operations		19.1%		26.8%		20.6%
Percentage of 5 year survivals—radical operations		33.3%		27.7%		28.6%

Operability.—Radical operations were performed in 60 of the 220 cases of carcinoma of the cervix regarding which we have sufficient data for study. On the basis of this figure the operability in this series was 27.3 per cent. Among 91 cases of carcinoma of the fundus, a radical operation was performed on 70, making an operability of 76.9 per cent.

Although various reporters have published operability percentages, it is obvious that their figures cannot be used as a basis of comparison unless the judgment of each reporter as to the standard of operability is known. Moreover, it is hardly possible even in the individual clinic to outline definitely such a standard. In general, we consider a case inoperable in which the broad ligaments and the parametrium are involved with extensions to the bladder and ureters and fixation of the uterus. Even this statement, however, must be considered as general, as in every case the possibility of operation must be individualized. Moreover, many cases which upon their first presentation appear to be inoperable, after a period of rest and observation may successfully endure even an abdominal hysterectomy, the change in condition being due to the subsidence of inflammatory processes during the period of rest and selected treatment. Thus, rest in bed before operation often reduces the size of the cervix and shows a diminution of the thickening and fixation of the ligaments. Other indications elsewhere in the body are, of course, also to be considered, although in such cases the inoperable cases may become operable by the appliance of therapeutic measures; thus, for example, a weakened myocardium may be strengthened by digitalis, renal complications may yield to treatment, etc.

Of particular interest in this discussion of operability is the short duration of symptoms and the extent of involvement at the time of operation. Thus, among the cases of cancer of the cervix, in three cases in which the symptoms had been recognized for less than a month, two were diagnosed as inoperable and the vagina was involved in one. In 36 cases in which the duration of symptoms had been less than a year, 30 were inoperable and the vagina was involved in six. These figures emphasize certain points to be made later regarding earlier recognition of carcinoma of this organ.

Incidence.—Our figures show the highest incidence of both carcinoma of the cervix and carcinoma of the fundus between the ages of 50 and 60 years. This is later than the findings of most reporters who place the highest incidence between the ages of 40 and 45 years. As to the occurrence in married and unmarried women, but six of our cases of cancer of the cervix occurred in single women. A similar relation exists in the case of carcinoma of the fundus, our series showing 78 cases among married women as contrasted with 10 among un-

married. These figures combined with the lack of recognition of early symptoms emphasizes the importance of Kelly's suggestion that "(1) The physician attending a woman at labor should, six or eight weeks later, make an examination and find out what lesions remain," and "(2) Every woman who has borne children should have a careful gynecological examination at least once every year until she is 55 years old," as in view of the symptomless early stages only by direct examination can one surely catch the very first stages of carcinoma of either portion of the uterus. This point is emphasized also by the fact that among our cases hemorrhage or other discharge was noted as the first symptom in 122 out of 132 cases of carcinoma of the cervix in which the first symptom was noted, and in 60 of the 68 cases of carcinoma of the fundus in which the first symptom was noted. It will require a very long period of propaganda and instruction of the public and medical profession at large to assure that every woman above the age of 40 will surely look upon any abnormal discharge from the uterus as a suspicious symptom upon its first appearance, especially during the period of the menopause.

Predisposing Causes.—The preponderating incidence of carcinoma of the uterus in married women, especially in women who have borne children, indicates that laceration and irritations of the cervix are certainly to be considered as primary predisposing causes. Poelese reports that chronic endocervitis preceded cancer in 34 out of 48 cases. Ewing maintains that polypoid myomas of the cervix are usually malignant at all ages and that the presence of a myoma in this region, therefore, is to be considered as a definitely premalignant condition.

In carcinoma of the fundus, Ewing believes that myomata are the first causative factors, an opinion apparently borne out by W. J. Mayo who states that "cancer of the cervix occurs 15 times as frequently as cancer of the body of the uterus, but in myomatous disease, cancer of the body of the uterus is found five times as frequently as cancer of the cervix, chronic irritation of the uterine tumors increasing the incidence 75 times." These opinions would seem to be strengthened by the fact that uterine myoma is estimated to be present in 50 per cent of all women over 50 years of age. Any local congestion or chronic endometritis aids the development of carcinoma. Cullen has reported perhaps the earliest squamous-cell carcinoma of the cervix which has been reported, its occurrence being discovered by an examination of the scrapings in a case curetted for hemorrhage due to hyperplasia of the endometrium and a small submucous myoma. Kelly and others urge the importance of most painstaking examination of all curetted material by someone sufficiently expert to recognize the presence of cancer cells.

As for the type of carcinoma, our findings to date coincide with

those reported by Ewing, squamous-cell carcinoma predominating among our cases of carcinoma of the cervix, and adenocarcinoma among the cases of carcinoma of the fundus.

Diagnosis—Early recognition.—In addition to the comments made above, it may be noted that cervical carcinoma yields earlier symptoms than does carcinoma of the fundus and that the symptoms of carcinoma of the fundus are more subjectively urgent; that is, in carcinoma of the fundus pain sometimes occurs due to distention of the muscular wall, whereas unfortunately pain is one of the latest symptoms of carcinoma of the cervix. A leucorrhea or hemorrhagic discharge which may be intermittent or persistent and becomes increasingly fetid in character is usually the primary symptom.

Extension.—Two striking characteristics of carcinoma of the fundus and of the cervix noted by Ewing seem thus far to be borne out by our own observations, that is, the tendency of uterine carcinomata to remain localized. Cullen found the nodes free in practically all cases examined by him. Ewing gives the reports of various observations showing lymph nodes free in a large percentage of the fatal cases of cancer of the fundus. Carcinoma of the cervix, while it extends early to contiguous structures, also is usually limited to the pelvis, its extension to the bladder, as one would expect, being of the most frequent occurrence. Very few cases of carcinoma of the vagina due to recurrence from the uterus or cervix are reported in the literature. In our own series we have one case of carcinoma of the vagina following a hysterectomy for a fibroid tumor, the only case we have noted. Hoffmann, in a limited number of cases, has made an interesting study of the relation of a primary carcinoma in the uterus to the development of cancer in other parts as also of the relation of carcinoma of the uterus to primary growths elsewhere.

TABLE II—HOFFMAN

PRIMARY SEAT OF GROWTH IN UTERUS IN RELATION TO CANCERS OF OTHER PARTS

Cancer of bladder	out of	18	in women	1
Cancer of breast	" "	314		1
Cancer of intestines	" "	166	" "	9
Cancer of liver	" "	184	" "	4
Cancer of ovaries	" "	21	" "	1
Cancer of peritoneum	" "	6	(pelvic organs)	1
Cancer of rectum	" "	48		1
Cancer of stomach	" "	326		3
Cancer of vagina	" "	11		2
UTERUS INVOLVED IN PRIMARY GROWTHS ELSEWHERE				
Bladder	out of	18		2
Breast	" "	314		1
External organs	" "	16	(pelvic organs)	1
Intestines	" "	166		4
Liver	" "	184		1
Ovaries	" "	21		1
Stomach	" "	326		3
Vagina	" "	11		3

Treatment.—In our judgment, in any patient past the menopause who has either a continuous or intermittent uterine discharge of any character, complete hysterectomy should be performed without delay and without hesitancy. We are told by some writers that uterine discharge is significant only when it is fetid and mixed with blood, but we do not believe that the character of the discharge should delay our treatment if the childbearing period is past. We urge strongly against curettage in these cases, as, if cancer is present, it will tend to disperse and disseminate the cancer cells. In these cases vaginal hysterectomy is performed and this can be done readily and successfully even in comparatively senile patients. A vaginal hysterectomy is performed also in a case of definite diagnosis of cancer of the fundus with the following precaution to prevent sowing the field with cancer cells,—alcohol gauze is first passed well within the cervix which is clamped off with heavy clamps.

In the case of suspected *carcinoma of the cervix* a section is first made for microscopic diagnosis. If the diagnosis was confirmed, our method in the past has been to destroy the local growth with the cautery and to pack the vagina with alcohol sponges which were left in place overnight. The following day an abdominal hysterectomy was performed with a wide dissection of the parametrium and the broad ligaments, an iodoform drain being placed well within the wound. These procedures applied to the certainly operable period, the operation being followed promptly by radium.

Because of the favorable results of radium and deep x-ray therapy in inoperable cases and the indications of its value in all stages of carcinoma of the cervix, we are, at present, not using surgery in any of these cases. We are, however, holding our final judgment in abeyance until a sufficient time shall have elapsed for a definite comparison of the three- and five-year results of radiation in early cases to be made. Fundus carcinoma is still treated surgically—except those in which metastases involve areas beyond the field of operation. These cases are treated by radium and deep x-rays.

Surgery vs. Radium and X-ray.—As to the comparison of the operative mortality and the length of life after operation combined with radium, with the results of radium treatment alone, few final statistics of value have thus far been published since the majority of reporters give results in but limited series of cases for longer periods, the periods in the majority of the reports extending over two or three years only.

Bumm reports 78 cases treated by radiation in 1913, 77 in 1914, and 127 in 1915. From this large experience he recommends operation in all cases of cancer of the cervix or fundus, in which the condition of the patient permits. This is in marked contradistinction to the judgment of J. G. Clark who reports the extreme opposite opinion

that radiation is always the method of choice in the treatment of carcinoma of the cervix, an opinion apparently shared by the Mayo Clinic as indicated in a communication by Dr. W. J. Mayo to Dr. Skeel: "The Wertheim type of operation has today only a very small field of usefulness. Personally, I have not done one in three years. Radium is taking the place of the extensive operation for the cure of carcinoma of the cervix with the exception of very early cases and it is possible that it will soon be the method of choice in all cases, either alone or combined with operation. For carcinoma of the body of the uterus, total hysterectomy is the operation of choice."

Schmitz' figures are shown in Table III.

TABLE III—SCHMITZ

APPARENT CURES FROM RADIUM TREATMENT FOR 2, 3 AND 5 YEAR PERIODS

	OPERABLE	BORDERLINE	INOPERABLE	RECURRENT
1914-1919 inc.	71.4%	54.5%	27.9%	2.2%
1914-1918 inc.	60.0%	55.6%	21.7%	0.0%
1914-1916 inc.	66.6%	40.0%	0.0%	0.0%

The principal objections urged against the radical operation are the postoperative sequelae, as well as the high mortality and the limited number of five-year survivals. Among the sequelae should be especially noted, cystitis, peritonitis, and fistulae of various types. Since some of these sequelae result also from the use of radium in inexpert hands, since we are by no means as yet assured of a radical cure by the means of radium alone, since without operation the suffering of the patient with carcinoma of the fundus is progressive and the outcome certain, it would seem that since surgery in combination with the postoperative employment of radium and x-ray gives the assurance of saving a large majority of the patients who present themselves in the operative stage, and of palliating suffering and prolonging the life with a fair prospect of ultimate cure in doubtful cases, we should hesitate to abandon such certainties for the uncertainties still presented by the use of radium and the x-ray without surgery in cases of carcinoma of the fundus, and should consider the advisability of abandoning surgery in cases of carcinoma of the cervix as still *sub judice*.

Our own operative mortality following radical operation alone, or followed by radium, has been 6.7 per cent in 60 radical operations for carcinoma of the cervix, 8.6 per cent in 70 radical operations for carcinoma of the fundus. Lincoln Davis gives a mortality rate of 9.3 per cent for radical operations for carcinoma of the cervix. Mortality rates published by other operators vary from 6 to 18 per cent, the latter figure being given by Janeway's figures for the Wertheim operation.

TABLE IV

VARIOUS STATISTICS REGARDING OPERATION AND OPERATIVE MORTALITY OF CARCINOMA OF CERVIX

	OPERATIVE MORTALITY	5 YEAR SURVIVALS
Cullen	15.1%	
Lincoln Davis	9.3%	40%
Graves	5.0%	
Janeway (Collected Statistics)	18.23%	19.34%
Cobb	11.16%	57%
Crile	6.7%	33.3%

As stated above, no ultimate value can be placed upon these figures without a knowledge of the extent of involvement, that is, the operative judgment as to the operability of the individual case.

SUMMARY

Our own standpoint at the present moment may be summarized as follows:

1. In any cases of abnormality in uterine function within the childbearing period, meticulous care to determine the cause of the abnormality.

2. In the case of any abnormal discharge after the menopause, immediate vaginal hysterectomy followed by the application of radium.

3. Radium and x-ray therapy in the treatment of all cases of carcinoma of the cervix, final judgment as to the abandonment of surgery in these cases being reserved.

4. Individualization of each patient; that is, certain cases of carcinoma of the fundus which are apparently inoperable may become operable after a period of rest and the application of selected therapeutic measures.

5. Extensive correlation of the experience of individual observers is essential to the establishment of a correct basis of judgment as to the relative merits of surgery, radium and of the x-ray in the treatment of carcinoma of the uterus—whether of the fundus or of the cervix.

EUCLID AT NINETY-THIRD STREET.

(*For discussion, see page* 611.)

RADIATION THERAPY OF CANCER OF THE UTERUS*

By Ursus V. Portmann, M.D., Cleveland, Ohio

(From the Cleveland Clinic)

THE treatment of cancer of the uterus and of cancer of the cervix has always presented a difficult problem. The observation that x-rays and radium rays have a more destructive effect upon malignant cells than upon normal tissue induced surgeons to the limited use of radiation therapy in the treatment of cancer of these tissues. Thus, the earlier era of purely operative treatment was followed by a period in which surgery was supplemented by the application of x-rays either before or after operation. During this period no better results were obtained than by surgery alone, because the x-ray treatment was purely empirical, that is, it was not based upon a knowledge of the physics of radiation nor was the dosage determined. During the last ten years the favorable results obtained by radium therapy, especially in the treatment of carcinoma of the cervix has tended to limit the surgical field to the treatment of early involvement of the cervix and to carcinoma of the fundus. However, the most favorable reaction to radium therapy and to surgery depends upon the extent of the malignant involvement. A therapeutic dose of radiation can be administered by radium to areas beyond the reach of the knife or the cautery, but there is a very large group of cases in which the involvement extends beyond the radius of radium activity and therefore, since in any given case the exact extent of the involvement cannot be known, the effects of surgery or of the application of radium cannot be exactly predetermined. These limitations of surgery and of radium therapy are met, in part at least, by the recent development of deep x-ray therapy which has provided another method of attacking malignant diseases within the pelvis, the extent of which may lie beyond the reach of operative procedures or of radium activity.

Radium rays and x-rays are identical in character, except that radium produces a small quantity of short waves of greater penetration than that of any rays yet produced by mechanical means. On the other hand, x-rays of sufficient penetration can be produced in larger quantities than can be secured from usually available amounts of radium. In view of these facts and the fact that x-rays and radium rays are governed by the same physical laws and produce identical biologic effects, it follows that they may be used to supplement each other,

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radium being used for intense local effects and the deeply penetrating x-rays of short wave lengths for broad diffuse effects.

The reaction of different types of cells to radiation varies considerably, some being highly susceptible and others very resistant. As a rule, cells undergoing rapid division are most susceptible. The endothelial cells of end-arteries and lymphatics are easily affected by radiation and the resultant swelling and death cause an obliteration of the vessel channels, thus cutting off nutrition and causing the death of tissue. Among tumor cells the rapidly growing types, such as those of small cell sarcoma, basal cell and embryonal carcinoma are especially susceptible. However, tumor cells of the same type often vary in their reaction to radiation under apparently similar conditions.

The therapeutic effect of radiation is thought to be produced primarily by direct action upon the tumor cells though secondary effects, as noted above, are the obliteration of vessels and probable stimulation of local resistance to the inroads of the disease by temporary round cell infiltration.

When x-rays are passed through gases the phenomena called ionization takes place, that is, the electrochemical relationship of the atom is changed. It is logical to assume that irradiation of living cells causes an exactly similar action, i. e., an electrochemical unbalance which is incompatible with the life of the cell. Dr. Crile and Dr. Fricke have found that irradiation causes a change in the electric conductivity of the blood. This has given encouragement for future investigation of the theory of the action of the short wave lengths produced by x-rays and by radium.

In view of the present status of our knowledge of the relative limitations of surgery, radium and the x-rays, we feel that the proper treatment of malignant disease consists not in the use of any one of these agencies but rather in the employment of certain combinations of methods according to the indications in each individual case. The limitations of surgery have been quite definitely proved by years of perfected technic. Radiation therapy is in its infancy, and as yet there are insufficient comparative data. I think that most surgeons now concede that radium therapy is the preferred method of attacking cervical carcinoma, although there is a small group of very early cases that may be successfully treated by operation. Even these, however, are as effectively and more easily treated by radium. During the last eighteen months our surgeons have practically abandoned the surgical treatment of cervical carcinoma. Now with the advent of deep therapy with x-rays we believe that we have a weapon which will not only prove as useful as, but broader in its application than radium.

When the use of short wave length x-rays was advocated we began a study of the physics of the problem with our Department of Bio-Physics. Our experiments soon proved that the very large intensities of x-rays

at deep locations as measured by early workers, actually could not be obtained by practical methods of application. By careful comparison and checking, our results and conclusions which will soon be published by Dr. Fricke, have been proved to be accurate. As a result of our experiments we were of the opinion that by x-ray alone we would be unable to obtain sufficient intensities of radiation to carry a therapeutic dose into the most deeply situated lesions such as a carcinoma of the uterus. It was probably fortunate for a possible series of cases that we made no attempt to use deep x-ray therapy alone, but proceeded at once to continue the local use of radium augmenting this with the application of deep x-rays.

There is no biologic standard for the measurement of radiation. Therefore, we assume a 100 per cent dose to be that amount of radiation necessary to develop a mild erythema of the skin within three or four weeks, and then compare the reaction of tumor cells to this reaction of skin. It was first suggested that a carcinoma dose was comparatively 130 per cent of the erythema dose. In the application of x-rays we fall just short of this because we are able to administer only from 80 to 100 per cent of the erythema dose to deep lesions. Therefore, to build up a homogeneous therapeutic dose in a uterus we use radium in the cervix, the activity of which gives approximately a 30 per cent homogeneous dose at a distance of about 4 cm. from the source. Thus, by combining the intensity of radiation from radium with that from deep x-rays there is built up a therapeutic dose that in a case of carcinoma of the uterus theoretically must eliminate all malignancy from the pelvic tissue.

Fortunately the uterus is one of the easiest organs to radiate. It is centrally located in the pelvis so that x-ray radiation can be applied through a number of portals around the body. The cervical canal lends itself to the local implantation of radium without any operative procedure other than some dilatation under nitrous oxid anesthesia.

The x-ray dosage that can be administered to a deep lesion depends upon the rate of absorption of the rays as they pass through the intervening tissues, and also upon the amount that the skin can stand without permanent injury. The ratio of absorption of rays is determined experimentally and charted. By means of these charts we are able quickly to determine the intensity of radiation at any depth below the surface. If the skin is given its maximum or 100 per cent dose over a certain area, then we find that at a depth of 10 cm. there may remain a dose of only 36 per cent, the rest of the rays having been absorbed. By using predetermined physical factors of voltage, current, distance, filter and time and by applying a skin dose to a number of different skin areas or portals of entry and directing our radiation toward the site of the lesion as a focus, we find that we can build up an 80 to 100 per cent dose. A radium absorption curve may now be superimposed

upon the x-ray chart and from this we can find the intensity of radiation that reaches each point from the radium. By the summation of the x-ray intensities and the radium intensities we determine the total dose of radiation that is administered to a lesion and at any point in the surrounding tissues.

I believe that the treatment of carcinoma of the cervix will become entirely confined to radiation therapy. Radium has already proved its value. Surgery and radium are equally successful in a small group of cases of early involvement. In a second group with vaginal involvement the operative procedure becomes more complicated and hazardous, and although good results are secured they are equalled or bettered by radium. A third group in which there is some involvement of the parametrium and a fourth in which the disease is widespread, the surgeon classifies as inoperable. These last two groups include an average of 62 per cent of all cases of carcinoma of the uterus. In cases of this type radium therapy has proved to be no less successful than surgery, and as the technic of radium application is being improved progressively better results are reported. It is particularly in the treatment of cases of groups III and IV that intensive radiation by radium and x-rays perhaps proves of greatest value as compared with surgery.

In making a comparative study of the results of radiation and of surgery it must always be borne in mind that the surgeons who first see these cases determine their operability. It is only within recent years, and even now only by a few surgeons, that any but inoperable cases have been treated by radiation alone.

As for carcinoma of the fundus, heretofore its treatment has been almost exclusively surgical because of the later metastases and the ease of approach to the lesion. In Dr. Crile's series 26.8 per cent survive five years. While it is doubtful whether radiologists can improve upon the results obtained by surgeons, nevertheless, the fundus is just as accessible to radiation as is the cervix, and fortunately the predominating types of carcinoma found there yield well to radiation. It may be, therefore, that accumulating statistics of the end-results in inoperable cases in which radiation has been employed may prove that in the treatment of carcinoma of the fundus, as in the carcinoma of the cervix, the application of radium and of the x-rays is the method of choice.

At this early date we have not sufficient data from which to compile statistics of the end-results of the treatment of carcinoma of the cervix by x-ray radiation. Experience thus far, however, leads us to believe that by the combination of radium and short wave x-rays patients have been distinctly benefited more than by previous therapeutic methods. We have not refused to treat any case. We have observed the immediate cessation of hemorrhage and pain, more rapid healing of local lesions, early softening and disappearance of induration and a more

rapid convalescence than by other methods. Improvement has naturally been particularly striking in some cases with extensive involvement.

The cases in which radiation has been least successful have been those in which some operative procedure has preceded irradiation. In cases of cervical carcinoma, if cauterization is performed, it should be followed by irradiation immediately. Except for diagnostic purposes curettement and excision of tissue should not be done unless radiation is administered at the same time.

The sequelae of radiation therapy are not severe. It is followed immediately by nausea which lasts for a few hours or days and diarrhea ensues in about ten days, lasting from four to five days. An erythema of the skin which should not be troublesome develops in three or four weeks.

The most important contraindication to radiation therapy is inflammation. In some cases of carcinoma of the cervix there is an inflammation of the adnexa. It is extremely hazardous to give intensive radiation in such cases as a fatal peritonitis may develop. A bad general physical condition or severe systemic disease may contraindicate irradiation, but if we proceed slowly or give a blood transfusion there should be no difficulty. Loss of blood or anemia is not essentially a contraindication as radiation quickly shortens the coagulation time of blood and transfusion can support a patient who is too anemic. Radiation does temporarily reduce the number of red cells, but we have as yet had no case in which this was a permanent or detrimental effect.

EUCLID AT NINETY-THIRD STREET.

(*For discussion, see page* 611.)

THE ROLE OF RADIUM IN THE TREATMENT OF CARCINOMA OF THE UTERUS*

By Thomas E. Jones, M.D., Cleveland, Ohio

(From the Cleveland Clinic)

VARIOUS phases of the vital problem indicated by the subject of this symposium are discussed in the papers offered by Dr. Portmann and Dr. Crile. I shall therefore confine myself to a brief statement of our personal experience with radium therapy.

Carcinoma of the Cervix.—The cases of carcinoma of the cervix which have been subjected to radium therapy during the past four years can be roughly classified into three groups:

I Inoperable cases treated with radium alone.

II Cases subjected to treatment with both surgery and radium.

III Cases treated with both radium and deep x-ray therapy.

In the treatment of the cases in group I—the inoperable cases—radium therapy yields excellent results. At first we were unwilling to treat early cases of uterine carcinoma with radium, but secured excellent results in the treatment of the inoperable cases. Thus, among nine cases treated over three years ago, four cases—45 per cent—are now apparently well. Even should any of these cases die during this year they have been able to live in comfort and their economic status has been assured for at least 5 per cent of the normal term of life—during the period in which a mother is an important factor in family affairs.

In the second group,—treated by both surgery and radium,—very bad results were secured and this combined treatment has been discarded.

The third group, in the treatment of which both radium and deep x-ray therapy have been used, shows the best results, although since this combined method of treatment has been in use less than a year we have no available statistics upon which to base a discussion of end-results—three or five year cures.

Method of Treatment.—The method of application of radium changes from time to time with increasing experience and with individual cases, for it is impossible to treat all cases alike. Often it is feasible to use needles, while in other cases their use is not possible. I think,

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however, that needles should be inserted wherever possible because by their use a more homogeneous radiation is secured.

It has been our custom to place 75 mg. in the cervix screened with 1 mm. of brass, 50 mg. against the cervix and 75 mg. (in 9 needles) inserted at various points in the cervix, the treatment being continued for periods varying from 12 to 16 hours. In from three to four weeks the patient is treated again by placing 125 mg. screened with 1 mm. of brass against the cervix for from 12 to 15 hours. Thus, each case receives a total dosage varying from 4000 to 4800 mg. hours. After the second treatment the patient is discharged, but comes in again for observation three months later.

Nausea is the one complicating factor to be considered. This is not invariable as some patients are nauseated and others are not. We have found no means of obviating this condition. There is no foundation for the popular use of alkalies. That there is no acidosis is shown by the fact that the potential alkalinity of the blood is increased after radiation.

We have not seen a single fistula, either rectal or vesical, in the cases treated with radium alone. They have occurred only in the cases treated with both surgery and radium. Proctitis with a slight stricture has occurred in only one case.

It should be borne in mind that in discussing the relative merits of surgery and of radiation in the treatment of carcinoma of the cervix the basis of comparison must be the morbidity and the end-results,—three and five year "cures"—as immediate mortality in these cases pertains only to surgery. No immediate mortality can be attributed to radium therapy. We are convinced of the value of radium in inoperable cases of carcinoma of the cervix; we believe that accumulating evidence will give equally positive evidence of its value in early cases.

Carcinoma of the Fundus.—On account of the excellent results of the surgical treatment of carcinoma of the fundus, up to the present time I have not advocated radiation in these cases. During the past year, however, in three cases we have seen a recurrence in the upper end of the vagina six months after a complete hysterectomy, and all three of these patients died less than one year after operation. This fact suggests that further investigation is demanded—perhaps a trial in cases of carcinoma of the fundus, in which there may be some contraindication to operation, such as old age, or cardiovascular disease, or objection to operation on the part of the patient.

EUCLID AT NINETY-THIRD STREET. (*For discussion, see page* 611.)

RELATIVE VALUES OF IRRADIATION AND RADICAL HYSTERECTOMY FOR CANCER OF THE CERVIX*

By John G. Clark, M.D., and Frank B. Block, M.D.,
Philadelphia, Pa.

SURGICAL statistics the world over demonstrate the fact that there is scarcely an anatomic situation which offers a more discouraging outlook for operative intervention than cancer of the cervix. It is not, therefore, surprising that many excellent surgeons have largely side-tracked the radical abdominal operation in favor of irradiation, since the low percentage of operability and the high rate of mortality have not proved a very alluring field for such a strenuous endeavor. In our own hands, in the Gynecologic Department of the University Hospital, notwithstanding the most assiduous endeavor, we were never able to achieve a salvage of more than 33 per cent of five-year cures, in a relatively small number of operable cases, which had been culled from a much larger group of hopeless cases. Several reports from other sources have demonstrated a higher percentage of curability, while some have dropped below this point. It was not difficult, therefore, to "swap horses" when the surgical race had been so poorly run by the first nag, and the second offered a hope for at least as good if not a better issue.

In our initial employment of radium, we proceeded with great caution, applying it only in hopelessly inoperable cases, but when this agent began to yield such startling palliative results, we widened its scope of administration to the zone of borderline cases, acting on the principle that irradiation, which is accompanied with almost no mortality, would work quite as effectively as a hazardous operation with its large percentage of rapid recurrences and infrequent cures. Again, after advancing our standard the results did not cast discredit upon this innovation, and for the last three years the choice of a radical operation has been limited to the absolutely favorable type, and they have been so few in comparison with the number of hopeless and borderline cases as to be almost negligible. It has been our endeavor to maintain as judicial an equilibrium as possible, not too hastily abandoning the old and not too unreservedly taking on this newer therapeutic method. After all, as our experience has taught, and statistical reviews fully confirm, there is no accurate or scientific method of determining the exact extent of any cancerous process, for not only does operability vary remarkably among surgeons of the

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highest merit, but even in one's individual experience, this instability is noted. What we might define as a borderline case at one time may be classed as inoperable at another.

There really is but one way of classifying cures in cancer, and that is, upon an actual basis of gross numbers. The question is, how many cases of cancer have you seen, and how many have you cured? Were the physician to attempt to define what is a curable, a borderline, or an incurable case of pneumonia, typhoid fever, or any of the numerous diseases which he encounters, he would hopelessly muddle statistics, and we are persuaded after a perusal of many articles on cancer, based upon this differential standpoint, that the results are glaringly chaotic. To put this matter in a nutshell, all cases of cancer recorded in our clinics should be included as a whole and not subdivided into classifications so subject to the large factor of human mutability. How better may one confirm this observation than by pointing to the accompanying compilation of the surgical results of ten skillful specialists? Thus Peterson in 380 cases considered only 15.7 per cent as operable whereas Graves in a series of 189 cases, operated upon 65 per cent. If such a wide difference occurs in the hands of two men of special skill, what may one expect from the surgical world at large? As we view this situation, we consider such an attempt to define surgical limits as practically useless. As an example of exaggerated caution, a writer has recently defined the curable case of cancer of the cervix as one which can only be recognized microscopically. This refinement of selection would essentially reduce operability to a vanishing point, and of course is the view of a surgical pessimist. The point which we wish to make is that mass statistics rather than differential values are, in the final run, the only safe basis upon which to rest our estimate of curability. Furthermore, the surgical mortality following the radical operation is even of wider variability, for in the accompanying table, the lowest mortality recorded is 5 per cent, whereas the highest is 26.6 per cent. Also, what one surgeon designates as a radical abdominal operation when compared with the extensive dissection of another surgeon might quite properly be classified as a simple panhysterectomy. And so goes the fallacy of statistics which are built upon such shifting sands.

The object of our paper is to compare surgical and irradiation statistics viewed from the standpoint of cures, and the mortality attributable to therapeutic intervention. In Table II the most recent results of radical operations from ten excellent clinics are epitomized, and a mere glance at these columns sets forth the ever intrusive human equation. Thus Martzloff's report from the Gynecologic Clinic of the Johns Hopkins Hospital shows a 14.2 per cent mortality and only a 26.6 per cent salvage—a poor exhibit in comparison with many other

reports. Knowing the method followed in compiling these statistics, we are confident, however, that none can be more strictly fair or more accurate. For instance, there has been a change of viewpoint in recent years among pathologists as to what constitutes malignancy in certain questionable changes. Taking into account this fact, Martzloff first reviewed the original microscopic slides of all cases diagnosed as cancer in the gynecologic laboratory, and chose only those which were unqualifiedly malignant, discarding all questionable cases, and still others which a decade ago were designated as malignant, but which are today otherwise classified. Upon this scientific diagnostic basis his clinical structure was erected. Just as the personal equation varies both in the perfection of surgical skill and judgment, so likewise may the ability and accuracy of the pathologist be measured. It has been our experience that even the best general pathologist is inclined often to pronounce glandular changes in the cervix as malignant, while another specializing in gynecologic microscopy will unhesitatingly take a benign view of the same case. This element of error is strikingly illustrated in a decision as to what constitutes a deciduoma malignum. Thus into all statistical reports in which there is a close microscopic question as to malignancy, an error may be introduced, which always favors a larger percentage of cures. For fear of dooming a patient because of an error of judgment, not infrequently the pathologist, when in this dilemma, acts upon the principle, when in doubt classify the specimen as cancer. For this reason we call especial attention to Martzloff's report, because there has been such a rigid sifting out of all questionable microscopic material. In the study of Table II, the widely varying viewpoints as to operability and the great divergencies between the surgical mortality and the five-year cures of several reporters is so vividly evident as to require no further comment. Such wide discrepancies in results can scarcely occur in any other domain of surgical endeavor.

STATISTICS ON TREATMENT OF CERVICAL CANCER

The Radical Abdominal Operation.—About ten years ago Jacobson compiled statistics on this subject. At a later date his work was included in the statistics of Janeway published in 1919 (*Surg., Gyn., and Obst.*, 1919, xxix, 242). The latest collected statistics are those of Duncan (*Jour. Am. Med. Assn.*, 1921, lxxvii, 604), which include Janeway's work (Table I).

A review of the literature for the past three years by Skeel (Am. Jour. Obst. and Gynec., 1922, iii, 252) demonstrates the obvious fact that the mortality rate declines with experience. He estimates that of every 100 cases of cervical cancer applying for treatment only 50 are operable. On an average, there will be a primary mortality of

TABLE I

CASES CURED FOR FIVE-YEAR PERIOD

	NUMBER OF CASES	OPERABILITY	PRIMARY MORTALITY	OF CASES TRACED	OF CASES OPERATED UPON	OF CASES APPLYING FOR TREATMENT
Carcinoma of Cervix Abdominal Operation	5027	1720	1090			
Percentage		34.21	18.23	35.41	19.32	11.72
Carcinoma of Cervix Vaginal Operation	1205	654	192			
Percentage		58.1	9.35	29.67	17.74	9.62

five (10 per cent), recurrences in 25 (50 per cent), five-year cures in 20 (40 per cent), while 50 will die without operation. He believes a radical operation lacks justification with such results if any other less hazardous measure offers an equivalent. Judged by this very fair standard, we have compiled the recent statistics from ten surgical clinics, and a glance at Table II will show how remarkably accurate is Skeel's estimate.

TABLE II

RADICAL OPERATION FOR CARCINOMA OF CERVIX

NAME OF REPORTER	JOURNAL	TOTAL APPLYING	OPERABILITY PER CENT	NUMBER OPERATIONS	PRIMARY MORTALITY	5-YEAR CURES
Martzloff	Bull. Johns Hopkins Hosp., 1923, xxiv, 141.	387	46 %	178	14.2%	26.6%
Mayer	Zentralbl. f. Gynäk., 1920, xliv, 617.	725	65.3%	457	20.3%	39.3%
Cobb	Jour. Am. Med. Assn., 1920, lxxiv, 14.			35	14.3%	57.1%
Graves	Surg. Gynec. and Obst., 1921, xxxii, 504.	189	64 %	119	5.0%	34.2%
Bonney	Brit. Med. Jour., 1921, ii, 1103.			100	20.0%	42.3%
Peterson	N. Y. State Jour. Med., 1920, xx, 313.	380	15.7%	60	26.6%	40.9%
Schweitzer	Zentralbl. f. Gynäk., 1921, xlv, 289.	443	40.0%	177	6.78%	51.4%
Davis	Ann. Surg., 1922, lxxvi, 395.	85	37.6%	32	9.3%	40.0%
Giesecke	Arch. f. Gynäk., 1922, cxv, 435.	371	70.6%	224	19.6%	33.5%
Bumm	Zentralbl. f. Gynäk., 1919, xliv, pt. 1, 1.			157		49.0%

The ratio of operability varies from 15.7 per cent to 70.6 per cent, but the oft repeated statement that low operability means high percentage of cures does not invariably hold since Peterson has the lowest operability (15.7 per cent), but his percentage of cures (40.9 per cent) is about the average, as stated by Skeel. Furthermore, his primary mortality is highest (26.6 per cent), which would indicate that

he performs a very extensive operation. In the entire series, the primary mortality varies from 5 to 26.6 per cent. Totalling the statistics we find that in 1539 abdominal operations, there were 608 five-year cures, or 39.5 per cent curability. This then represents the present curability of cervical cancer in the hands of the most experienced surgeons throughout the world. The percentage of cures is slightly higher and the primary mortality is a bit lower than Janeway found a few years ago.

In the compilation of statistics on radiotherapy of cervical cancer, for purpose of comparison, we encounter some difficulty. While radium is widely used, and there is much literature upon this subject, there are but few reports which deal with five-year cures—not because they do not occur, but because this innovation is yet in its infancy. Heyman reports 26 cases, 85 per cent of them inoperable, and seven, or 29 per cent, have been cured over five years. We have taken from Bailey and Healy's report, not yet published, only the cases treated by their new technic in the Memorial Hospital of New York, which have passed the five-year test. These surgeons have had available for use maximum amounts of radium. In this Table, there are 160 operable cases treated by radium five years or more ago with 69 or 43.1 per cent cures. Of the inoperable cases, there were 418 subjected to irradiation with 38 or 9 per cent five-year cures.

TABLE III

RADIOTHERAPY IN CARCINOMA OF CERVIX

		OPERABLE	BORDERLINE	INOPERABLE	RECURRENT INOPERABLE
Burnam	N. Y. State Jour. Med., 1920, xx, 316.	50%	31%	9 %	11%
Flatau*	Zentralbl. f. Gynäk., 1923, xix, 737.	50%		9.5%	
Bailey and Healy	Jour. Am. Med. Assn., 1923, lxxxi, 65.	27%	24%	14.5%	22%
Schmitz	Northwest Med., 1923, xxii, 77.	42.85%		6.3%	
Bumm	Zentralbl. f. Gynäk., 1919, xliv, pt. 1, 1.				
	Series 1913	28.5%	23%	4.7%	
	" 1914	20.0%	19%	5.5%	
	" 1915	55.0%	39%	10 %*	

*Denotes all cases not over five years.

This analysis of cases recorded in medical literature shows that in general, radium gives a curability of 43 per cent as against 39.5 per cent obtained by radical operation in cervical cancer. Further, the 9 per cent inoperable cases that were cured would all have died under any other treatment.

From Table III it will be seen that the treatment of cancer of the cervix by irradiation has stood a very fair test in comparison with

the radical operation. Our own statistics, which are fully up to date at this time, do not, however, show such good results as those set forth in most of these reports, and are not so favorable as we anticipate the next five-year report may be. In our series, there were 22 operable cases with 27.2 per cent cures; in the inoperable cases, there were 6.7 per cent surviving and free from evident recurrence at the end of five years. In our total of 144 cases only 15 per cent of which were operable, 10.4 per cent safely passed the quinquennial test. During the last four or five years, we have always irradiated under gas anesthesia, which has rendered the treatment in the latter group more effective, but this series has not yet passed the quinquennial test. However, a full trial has been made by us of both the radical operation and the treatment with a moderate dosage of irradiation (100 milligrams of radium for 24 hours) repeated at later intervals once or at most twice, if necessary, and we are convinced that while the latter method has been of immeasurable help in the relief of the inoperable and has effected a cure in a small percentage of those otherwise doomed, nevertheless, it falls far short of an ideal remedy but compares most favorably with the radical operation. As we have stated in previous paragraphs a series of radical operations reported from the Gynecological Clinic of the University Hospital in 1913, yielded only a 33 per cent curability with an 8 per cent incidental mortality. In 22 cases treated by radium with no primary mortality, 27.2 per cent passed the five-year period. When we add a 6.7 per cent of five-year cures in the inoperable class it will be seen that the results are practically equivalent to those obtained by the radical operation. On the other hand, in estimating the relative values of these two plans of treatment on a basis of hospital economics, the efficiency of the two classes of patients immediately after treatment, the checking of distressing symptoms, and the reduction of morbidity, the argument is manifestly in favor of the irradiation series. However, the distressing fact is still quite evident that while irradiation is of inestimable value as a therapeutic agent and removes from the surgical domain the great majority of cases of cancer of the cervix, we are not as yet in sight of a real and efficient remedy for this disease in by far the overwhelming majority of cases.

We have classed as operable those cases in which the disease had not extended beyond the cervix or the body of the uterus. The inoperable cases were those in which the disease had extended into the broad ligaments, vagina, had invaded the vesical or rectal walls, or had metastasized to remote glands. Also, under this head were placed all cases the records of which did not show in accurate detail the extent of the growth.

As to the relief of symptoms, we find the results about the same as

TABLE IV

RADIUM TREATMENT OF CARCINOMA OF CERVIX. CASES APPLYING FOR TREATMENT IN THE GYNECOLOGIC DEPARTMENT OF THE UNIVERSITY HOSPITAL BETWEEN JANUARY 1, 1914 AND JANUARY 1, 1919

(Compiled by Dr. Robert Kimbrough)

TOTAL NO. CASES	OPERABLE (22 CASES) 5-YEAR CURES	INOPERABLE (118 CASES) 5-YEAR CURES	RECURRENT INOPERABLE (4 CASES) 5-YEAR CURES	TOTAL 5-YEAR CURES
144	27.2%	6.7%	25%	10.4%

reported in previous papers on this subject issued from the Gynecological Department of the University Hospital. In conclusion, we again reiterate our oft repeated statement that radium is a palliative remedy of inestimable value in the great majority of hopeless surgical cases and of absolute curative value in a small percentage. While it challenges most favorable comparison with the radical abdominal operation, nevertheless, we take no issue with the skillful specialist who still adheres to the radical viewpoint, provided he supplements his operation with postoperative irradiation. As to anteoperative irradiation, we are still doubtful, and await with interest the report from those clinics in which this prophylactic plan is employed. To discard or fail to use this newer remedy as an adjunct to surgical measures in the face of such statistics as are now available should lay the objector open to a charge of serious negligence.

2017 WALNUT STREET.

(*For discussion, see page* 625.)

CARCINOMA OF THE BODY OF THE UTERUS (WITH THE REPORT OF 115 CASES)*

By Charles C. Norris, M.D., and M. E. Vogt, M.D.,
Philadelphia, Pa.

WITH the advent of radium, the study of carcinoma has received a great stimulus, and perhaps in no variety greater than that which occurs in the uterus. Probably owing to the unsatisfactory results secured by operative intervention and probably also to the greater frequency of the neoplasm, this interest has been rather centered about cervical cancer. The following study embodies the results obtained by operation and irradiation in a series of 115 consecutive carcinomata of the body of the uterus, especially emphasizing the end-results.

Carcinoma of the uterus may be divided into that form which originates in the cervix and that which springs from the fundus. These are different tumors, histologically and clinically, and a definite line should be drawn between them. Carcinoma of the fundus is less common than that of the cervix. Among 12,514 gynecologic patients observed during the last 23 years at the University Hospital, there have been 115 cases of fundal carcinoma. During a like period 346 cases of cervical carcinoma have been observed among 756 cases of carcinoma of the genital tract. Thus in our series, carcinoma of the fundus constituted about 15.2 per cent of all cancers of the genital tract and about 25 per cent of all uterine cancers. Frank[1] places the former figure between 10 to 15 per cent; Peterson[2] 18.8 per cent; and Wilson[3] 11.2 per cent.

It is an established fact that chronic irritation is a distinct predisposing factor towards cancer. Cervicitis, especially in cervices which have been the seat of laceration, is extremely frequent, whereas true chronic corporeal endometritis is infrequent, and if we exclude the tuberculous type, quite rare. It is probable that these facts have a definite bearing on the greater frequency of fundal than of cervical carcinoma. The combination of genital tuberculosis and carcinoma has been recorded by a number of observers (Norris,[4] D'Halluin and Dalral[5]).

Carcinoma of the fundus is generally a disease of advanced life occurring on an average somewhat later than carcinoma of the cervix. The following presents the age in decades in our series:

*Read before the Philadelphia Obstetrical Society, November 1, 1923.

20-30	1 case	(29 years of age)
31-40	14 cases	
41-50	18 "	
51-60	57 "	
61-70	21 "	
71-80	4 "*	

The average age in this series was 53.29 years; 100 of the 115 cases or 86.9 per cent were 41 years of age or over, and 82 or 71.3 per cent were 51 years or older, the greatest number, 49 per cent, occurring between 51 and 60 years. Peterson states that 73.2 per cent of his patients were between 55 and 65; Koblanck[6] 50 per cent between 50 and 60; Cullen[7] and Wilson observed similar findings.

Carcinoma of the cervix is rare in nulliparous women, 26 per cent of carcinoma of the present series occurring in spinsters. It would appear that childbirth plays little part in the etiology of this neoplasm, and that the disease is relatively as frequent in the nulliparous as in the multiparous.

The most important symptoms are hemorrhage and discharge. The hemorrhage usually begins in the form of "spotting," generally small in amount. It may follow trauma, but this is not as constant as in cervical carcinomata; in the latter the vascular, friable cancer is from its location, less protected. The hemorrhage becomes more frequent and profuse as time goes on. This rather rapidly progressive character of the bleeding is characteristic of all malignant uterine neoplasms. Rarely until the later stages, is the amount of blood lost sufficient to produce a marked alteration in the blood picture. It should be emphasized that the bleeding produced by carcinoma of the fundus is a metrorrhagia. Menstruation, if still present, is probably in no way affected and occurs regularly and is usually of the normal duration. Occasionally a carcinomatous hemorrhage may accidently occur a day or two before or after the normal period, and thus simulate a prolongation of the normal flow but as a rule, it is definitely intermenstrual in type.

Owing to the age at which carcinoma of the fundus usually de-

*Since compiling these statistics, we have observed a case of adenocarcinoma in a young woman, twenty years of age. The case was referred to the gynecologic ward of the University Hospital with a diagnosis of incomplete abortion. Carcinoma of the fundus was diagnosed from the curettings and hysterectomy revealed an early cancer in the fundus not more than 1.6 cm. in diameter. Despite the early stage of this tumor, a small metastasis had occurred in one ovary. This case offers an opportunity to study the rapidity of growth of adenocarcinoma. The curettage was performed September 21st, and owing to various difficulties, among them that the patient had left the city, hysterectomy was not performed until six weeks later. At the time of curettage, the tumor must have been extremely small as practically all the tissue removed was normal except a small shred a few millimeters in diameter, which showed a typical picture of carcinoma. When the uterus was removed, the tumor was easily recognizable macroscopically and measured 1.6 x 1 cm. There was little penetration of the myometrium. The neoplasm had evidently originated from the surface epithelium and was of the variety sometimes spoken of as adenomalignum. The Sampson theory of perforating cyst is applicable to this case as an explanation of why such an early specimen produced metastasis. The curettage dislodges carcinoma cells, the postoperative pain produces uterine contractions, the ovarian metastasis (or implantation) was upon the surface of the ovary and was of about the size that would be expected under the circumstances.

velops, the irregular bleeding of the cancer is often attributed to the menopause or to a recurrence of the menses. A slight amount of bleeding frequently follows straining at stool, and this is often attributed by the patient to hemorrhoids. The origin of the hemorrhage can be easily determined by instructing the patient to insert a small piece of cotton or gauze into the vagina prior to defecation and examining same shortly after the bowels have moved. The discharge is thin, irritating, often bloody and malodorous. The foul odor depends upon the amount of degeneration which has occurred on the surface of the cancer. Some authors state that discharge is usually the first symptom and this may be true. A small amount of discharge is, however, less noticeable than a small amount of bleeding and for this reason, the latter is the more important symptom.

An analysis of our case histories shows that in 81 per cent of our patients, hemorrhage was the first symptom and in the remainder, discharge was noticed prior to the bleeding. Hemorrhage, however, occurred in all at a later date, whereas in a few of our early cases, discharge while perhaps present in small quantity, probably was not noticed by the patient. In carcinoma of the fundus, hemorrhage is worth about 75 points in the diagnosis, and discharge about 25; whereas in carcinoma of the cervix, the symptom of hemorrhage is of even greater diagnostic value, probably being worth 90 points and discharge 10 points. Hemorrhage and discharge are the only subjective symptoms of much value; pain, cachexia, loss of weight, etc., generally indicate an advanced and hopeless condition.

The importance of early diagnosis cannot be overestimated. The subjective symptoms during the early stage are by no means characteristic. In our series, less than 25 per cent were early cases. A study of the present series proves that two factors stand out dominantly as reasons for the advanced stage in which most of these cases were when first observed. The first is that the lesion is painless during the early stage. Nothing will bring a patient to a physician more quickly than pain, and the absence of this symptom during the early stage of all uterine cancers, is an important and unfortunate factor. The second reason that patients are prone to disregard the early symptoms is that the menopause itself is usually irregular; probably not one woman in ten passes through this period of life without some irregular bleeding. Many women, therefore, disregard the slight irregular bleeding or slight discharge which are the only symptoms of the cancer during its early stage, under the belief that the hemorrhage is the result of the menopause and if she inquires among her friends, this opinion is almost sure to be confirmed.

The reason that this misapprehension is so firmly established in the lay mind and so difficult to eradicate, is that in 90 per cent of women

the irregularities are due to some benign condition, and as a result the belief becomes more firmly fixed. Carcinoma of the fundus often develops after the menopause and after the woman has gone through a more or less prolonged period of irregular bleeding, and under such circumstances the hemorrhage is often attributed to a return of the menstrual flow. Furthermore, carcinoma develops at a period when various minor lesions are prone to cause bleeding.

It is obvious, therefore, that the great majority of irregularities are not the result of cancer, and for this reason this danger symptom is often disregarded during the period when its observance would be of most value. The disinclination to submit to a gynecologic examination combined with the good general health often enjoyed by the patient during the early stage of cancer of the uterus, are also contributing factors in "letting the condition go for a while and seeing if they will not get well."

To the experienced physician the symptoms previously described are always suspicious, and the condition is very properly viewed as malignant until proved otherwise. This proof, however, is not always easy. The ordinary pelvic examination is generally entirely negative. In 65 per cent of our early cases, the uterus was normal in size, showing definitely that increase in size of the uterus is by no means a constant conditon. The curette of course offers a practically certain means of diagnosis.

The test suggested by Dr. John G. Clark, while less certain, is of great practical value. This is applicable to all suspicious cases and may be safely employed as an office procedure. It consists in cleansing the external genitalia, vagina and cervix thoroughly with an antiseptic solution and then passing under sight a sterile sound to the fundus of the uterus and gently manipulating the point of the instrument over the entire endometrial cavity. If a friable, vascular growth such as carcinoma is present a small trickle of blood will be observed. A satisfactory means of employing this test is, after the cleansing of the vagina, to introduce a Sims speculum and partially fill the vagina with bichloride solution, 1-2000, so that the cervix is immersed in a lake of the liquid. Under sight a sterile sound is then introduced and gently raked over the entire endometrial cavity. We all know how a few drops of blood from a nose bleed will discolor a basin of water and in the same manner, a few drops of blood will be easily demonstrated in the clear solution in the vaginal lake. In employing this test, the cervix should not be grasped with a tenaculum.

As it is possible that other pathologic conditons may cause bleeding from this test, the nonappearance of blood from the cervix indicates strongly that no cancer is present. One of the writers has em-

ployed this test frequently and has never seen it fail when a carcinoma has been present. Ewing has suggested taking smears from the fundus of the uterus, and by this means has been able to demonstrate in a proportion of cases, the presence of carcinoma cells or fragments of the tumor. A combination of the Clark and Ewing tests may be easily employed and is of great practical value. Neither of these tests is conclusive in all cases, and the surgeon will have to depend upon the microscopic examination of the curettages for the final and positive diagnosis in the majority of the early cases.

Absolute asepsis is essential in the employment of either the Clark or Ewing tests. The great advantage of the Clark test is that it may be employed as an office procedure; it involves no loss of time and requires no special skill or expensive apparatus. We feel sure that if this test were more widely employed, many early cases of carcinoma would be detected which would otherwise remain unrecognized until the disease became advanced.

To the experienced physician, a tentative clinical diagnosis in a patient who has passed the menopause, and in whom there has been an absence of bleeding for some years prior to the development of the cancer, is generally easy. When symptoms develop at the time of the menopause, the clinical diagnosis is much more difficult.

In our entire series, the clinical diagnosis was correct and positive in 57 per cent of cases. Carcinoma of the fundus was suspected in an additional 23 per cent of cases, and in 19 per cent the cancer was unsuspected. An analysis of 58 cases in which a diagnostic curettage was performed, shows even more forcefully the importance of a histologic examination. In this series 36.8 per cent were correctly and positively diagnosed clinically; in an additional 37.9 per cent the malignant character was suspected, and in 25 per cent the clinical diagnosis was benign. In addition, many cases clinically suspected of being carcinoma were proved benign or a result of curettage.

Of the 20 cases in which the clinical diagnosis was benign but proved malignant, 15 were associated with myomata. Thus in 75 per cent of the unsuspected cases the symptoms of the cancer were masked by those of preexisting myomata. Myomata are the most common uterine neoplasms and their association with cancer is by no means infrequent. In our 115 cases of carcinoma, 24 were associated with myomata. In the early stages the bleeding produced by these two forms of neoplasms is generally quite distinct; the myoma producing menorrhagia, and the carcinoma metrorrhagia of the type previously described; but often in the later state of the myoma, the bleeding becomes markedly irregular and these are the cases in which error is especially likely to occur.

The association of fundal carcinoma with myomata is an interesting

one, and despite the amount of research which has been done upon the subject, it is still questionable whether or not myomata are a predisposing factor towards cancer. In the present series, carcinoma of the cervix is about three times as frequent as carcinoma of the fundus. Noble[8] found carcinoma of the fundus more frequently than of the cervix among 5,000 myomata, in the proportion of 75 to 63. Williams[9] found carcinoma of the fundus in 1.4 per cent of his myoma cases. Our statistics show 115 fundal carcinoma as compared with 1983 myoma, a proportion of a little more than one fundal carcinoma to every 17 myoma.

The aforementioned figures demonstrate the importance of a diagnostic curettage in all suspected cases, and also emphasizes the importance of a preliminary curettage prior to all irradiation of myomata. For the performance of a successful histologic diagnosis from curettings, it is essential that the pathologist possess a thorough knowledge of the changes which take place in the normal endometrium during the menstrual cycle at different ages, as well as the changes produced by pregnancy. He should be furnished with such data from the history of each case as are necessary. Recently a number of papers have appeared in the gynecologic literature decrying the operation of curettage as a routine procedure. This has no bearing on diagnostic curettage. Were diagnostic curettage to be eliminated from the number of justifiable operations, few early operations for fundal carcinoma would be performed and many benign lesions would be treated as malignant.

A diagnostic curettage should be a thorough one as the carcinomatous lesion may be small. Obviously, it is impossible for the pathologist to make a correct diagnosis unless he receive the tissue. It is possible to make a diagnosis of carcinoma from a very small fragment of tissue, provided this presents a typical picture; a larger quantity of material, however, greatly facilitates the laboratory diagnosis, and in a series of cases, materially increases the proportion of correct conclusions.

The accuracy with which histologic diagnosis may be made in a large series of cases has occasionally been questioned, and Deaver and Reimann[10] have even gone so far as to recommend abdominal hysterotomy in suspicious cases. In the laboratory of gynecologic pathology at the University Hospital, a diagnosis of carcinoma of the fundus has never been made from curettings which, when the uterus was subsequently removed, did not confirm the histologic findings. Nor, so far as our knowledge goes, has a case which was diagnosed benign by the pathologist, ever been shown to be malignant. Some of our cases in which a diagnostic curettage has been performed and a benign diagnosis made from the histologic findings, have not been

traced and may therefore have been mistakes by the pathologist, but in view of the fact that a very thorough follow-up system is in force, even this appears doubtful. Cases can, however, be imagined where a cancer may develop in the crevice of a uterine cavity, the seat of one or more submucous myomata, in which it would be impossible for the curette to reach the carcinomatous tissue, but these must be extremely rare.

One case occurred in which a woman presented herself, having a large nodular mass in the pelvis, and who had been bleeding irregularly and profusely for a long period of time. The diagnosis was myoma of the uterus and the patient was referred for irradiation. A curettage had been performed in a neighboring city and a histologic diagnosis of polypoid endometritis made by another pathologist. This case presented all the clinical characteristics of a myoma, and on account of the poor general condition of the patient, due to her hemorrhages, it was decided to apply radium. At the time of the irradiation, a curette passed lightly over the endometrial cavity failed to secure any tissue, probably due to the fact that the former curettage had been performed but ten days previously. This patient failed to improve, sought surgical assistance elsewhere and at hysterectomy some time later, a carcinoma of the fundus was discovered. In this case, it was impossible to secure tissue on account of the former curettage.

Despite this case, we believe that accuracy in histologic diagnosis of curettings is possible in nearly 100 per cent of cases. Carcinoma of the fundus may originate upon the surface of the endometrium and, at this stage, it is theoretically possible for a curettage to remove the entire lesion. A number of cures by curettage are on record and may undoubtedly occur. Ladinsky[11] has collected 22 such cases; also Frank[12] and Weiner.[13] Such instances must, however, be extremely rare. It is hardly probable that such early carcinomata would produce symptoms, and unless the curettage is performed for some other cause, it is unlikely that such cases would be observed. Specimens from such cases should be subjected to an extremely rigid pathologic examination, for the possibility of a misinterpretation of the histologic picture must be considered. It is not improbable that an endometrial polyp which was undergoing carcinomatous degeneration might be entirely removed by curettage and thus result in a permanent cure. This would be especially likely if the carcinomatous area were confined to the distal extremity of the polyp.

One of the writers (Norris[14]) has elsewhere drawn attention to the limits of microscopic diagnosis. Occasionally doubtful histologic pictures will be observed which will be interpreted differently by even the most experienced pathologists. As a general rule, such specimens

are usually benign. If the curettage has been a thorough one, there is rarely room for doubt in the class of cases under discussion. Was such a case to occur, it would be wise to be governed by the clinical evidence present. Certainly a second diagnostic curettage would be indicated, in any event, should there be a recurrence of symptoms. In the performance of diagnostic curettage in cases suspected of being carcinoma of the fundus, care must be observed not to perforate the uterus; this is a quite possible accident in advanced cases. (Schottländer and Kermauner[15]).

We have dwelt somewhat upon the question of early diagnosis because we feel that it is the key-note to the situation, and provided proper treatment is instituted, carcinoma of the fundus is generally considered a relatively hopeful form of cancer, especially when compared to carcinoma of the cervix. Many authors place the percentage of cures as high as 60 to 75 per cent. This has not been our experience. A careful study of our cases, while it shows better results than those secured in the cervical form of cancer, is by no means satisfactory. Only 44 per cent of 115 patients are alive today, and some of these are alive with recurrences and in others, recurrence will develop.

Carcinoma of the fundus is obviously a more favorable form of cancer than is the cervical variety. The cervix is surrounded by vital structure—bladder, rectum, ureters, etc.—and extension into any of these renders a favorable end-result unlikely. Because the cervix is intimately associated with adjacent structures, extension is more likely to occur and makes a wide removal more difficult. When the cancer originates in the fundus, it is surrounded by a thick muscular envelope—the myometrium; the fundus is free on both the anterior and posterior surface and the upper portions of the broad ligament are easily removable. The lymphatics of the fundus are abundant. Metastases and rapidity of growth of carcinoma of the fundus appear to vary somewhat according to the age of the patient and the type of the tumor. The duration of symptoms is about twice that of cervical cancer.

Ewing[16] states that the lymphatics of the corpus begin at the endometrium, pass upwards and outwards and leave the uterus in four or five trunks just beneath the tubes, pass through the broad ligaments, anastomosing with the ovarian plexus and about the ovarian artery in the pelvic ovarian ligament, to end in the lumbar nodes above the bifurcation of the aorta; from the middle of the corpus, other vessels mingle with those from the cervix, reach the iliac nodes, parametrial, iliac, hypogastric, sacral, lumbar and inguinal, form the regional nodes of the uterus. Beyond these there is a wide communication with each other and with vessels of the bladder, rectum, kidneys and abdomen.

In many cases individual susceptibility of the patient also seems to be an important factor in the question of metastasis and rapidity of growth. Many efforts have been made to correlate the malignancy of the carcinoma with the histologic type of cancer. Practically all carcinomata of the fundus of the uterus are of the glandular type, although we have encountered one squamous-celled carcinoma in this locality in a specimen forwarded to us by Dr. John L. Atlee of Lancaster.[17] Especially noteworthy in this effort, is the recent research of Mahle.[18] He states that cellular differentiation appears to be the most important factor in determining the malignancy in any given case. We have carefully reviewed our specimens with this conclusion in mind, and while we agree with Mahle's statement, we have observed a number of contrary findings. Our experience has been that, as a general rule, those tumors, the cells of which exhibit a marked tendency towards mitosis, a marked tendency to break through the basement membrane, are the most rapid in growth. Such tumors are naturally surrounded by a more well-defined zone of inflammatory reaction than are more slow-growing neoplasms. This inflammatory reaction consists largely of lymphocytes. Marked irregularity in the size of the tumor cells and hyperchromatosis are also generally present in extremely malignant form of tumors.

The chief point in prognostic value is the integrity of the myometrium. In some specimens, the myometrium is hypertrophied, but this is unusual, although edema is generally present in advanced cases. The macroscopic examination offers a rough, but fairly accurate, guide to the advancement of the case, and on cut sections, it is usually possible to determine moderately accurately, the extent of the growth. In two specimens we have observed subperitoneal involvement, due to extension along the blood vessels from small tumors. Ewing has recorded a similar experience. The macroscopic appearance may be intensified by making a thin slice of tissue and flooding it with polychrome methylene blue No. 13; the tissue is then rinsed in distilled water and examined with the naked eye, and with a magnifying glass, according to the method suggested by Terry.[19] As a general rule the younger the patient, the more malignant the tumor.

The duration of the symptoms prior to treatment naturally bears a definite relationship to the prognosis.

An analysis of all our 3-year cases shows the following:

THE RELATIONSHIP OF THE DURATION OF SYMPTOMS TO PROGNOSIS

DURATION OF SYMPTOMS	NO. OF CASES	PERCENTAGE OF 3 YEAR PATIENTS ALIVE
6 months or less	24	57.
7-12 months	32	31.2
1 year or more	28	17.8

In 59 or 71 per cent of these cases, the duration of symptoms was between 5 and 18 months. In over 15 per cent, the symptoms had been present for two years or more.

The treatment of choice for adenocarcinoma of the fundus of the uterus consists in panhysterectomy and bilateral salpingo-oophorectomy. Whether or not preliminary or postoperative irradiation, or both, will be found advisable is still a mooted point. In the Gynecologic Clinic of the Hospital of the University of Pennsylvania, preliminary irradiation has not been resorted to routinely, and postoperative irradiation has been employed only in selected cases, usually when the tumor was found to have been in an advanced stage. The Wertheim operation has not been performed as a routine procedure, although as extensive a hysterectomy as is possible for the individual case has been performed. For those cases in which the carcinoma is too advanced for hysterectomy, radium irradiations are an excellent palliative procedure and in some cases appear to be curative. The dosage employed has generally been 2400 mgh. and in a few cases postoperative irradiation by means of deep x-ray. From the study of our end-results, we are led to favor the routine postoperative irradiation in all cases that offer any hope of cure. The following table presents the results in all cases including those too advanced for any form of treatment:

Total number of cases	115	
Percentages of cases traced	91.31	per cent
Percentage of mortality from all causes	56.	per cent
Percentage alive	44.	per cent

We realize the fallibility of an arbitrary statement regarding 3- or 5-year cures, but for purposes of comparison and study, have adopted the 3-year standard. We are aware that recurrences may occur in some of our 3-year cases which now appear well, but have employed this period in order to secure groups of sufficient size to warrant the deduction of at least tentative conclusions. Weibel[20] viewing Wertheim's cases, found that all recurrences occured within three years. The chief value of statistics relating to carcinoma are those showing the end-results. In compiling statistics relating to cancer, two points are of paramount importance; the first is the number of 3- or 5-year cases which have been observed and the number which are alive; and the second vital point is what methods have been resorted to, to secure the results. Comparison of operative statistics may be misleading unless accompanied by figures relating to the percentage of operability. One surgeon may operate upon 90 per cent of his carcinoma patients and another upon only 10 per cent; the latter will probably be able to show a much higher percentage of 5-year cures among his

operative cases and a lower operative mortality, whereas the former may actually have more 5-year patients alive.

The following table presents the results of all our three-year cases traced without regard to the form of treatment or the advancement of the disease, and includes cases too advanced for either irradiation or operation:

Total number of 3-year cases	87
Percentage alive	34.8
Percentage alive, no recurrences	27.9
Percentage alive with probable recurrence	6.9
Percentage of cases dead, all causes	65.1

The following table shows the 3-year results in those cases upon whom hysterectomy was performed. These, in general, are the earlier cases:

Total number 3-year hysterectomies	57
Percentage alive	37.5
Percentage alive, no recurrence	30.5
Percentage alive, probable recurrence	7.
Percentage dead, all causes	62.5

Cullen records 60 per cent of his cases alive but some of these were operated only one year previously. Wilson[21] records only 24 per cent of absolute cures. Sixty-five per cent of our 3-year cases were subjected to hysterectomy and this list contains a relatively large proportion of moderately advanced cases.

The following table shows the results secured in a series of hysterectomies performed for early moderately fundal carcinoma:

Total number of early 3-year cases	26
Percentage alive	54.
Percentage alive, no evidence of recurrence	42.
Percentage dead, all causes	46.

Whereas this group is too small from which to draw definite conclusions, we believe that 50 to 60 per cent of ultimate cures may be expected from this class of cases. This group includes only cases in which no metastasis was discovered at operation, and in which the growth was macroscopically limited to the fundus and in no instance was there less than 1 cm. of macroscopically normal myometrium between the tumor and the serosa.

Preliminary irradiation has not been routinely adopted in the present series. The following table shows the results secured in a small series of cases in which this treatment was adopted, the dosage varying from 1200 to 2400 mgh.

Three-year cases treated by radium irradiation followed by hysterectomy:

Total number of cases	10
Percentage alive	50.
Percentage mortality, all causes	50.

Total number of 3-year cases treated by curettage and radium irradiation alone:

Total number of cases	20
Percentage 3-year cases alive	45.
Percentage 3-year cases alive, no recurrences	35.
Percentage 3-year cases alive, probable recurrences	10.
Percentage 3-year cases dead, all causes	55.

The number of cases comprising this group is too small from which to draw definite conclusions. Small group statistics are unreliable as a few cases alter results so markedly. The majority of cases constituting this group were too advanced to permit of radical operative intervention. In addition, however, it includes a few extremely early cases and because of this mixture, it is somewhat unsatisfactory as a means of comparison to the preceding groups. Whereas the figures in this table emphasize the value of radium irradiation, and are actually superior to those secured by hysterectomy in the proportion of 45 per cent alive after three years, as against 37.5 among those submitted to radical intervention. At the risk of repetition, we would warn from drawing too definite conclusions from such a small number of cases as this table comprises. Nearly all of the patients in this group were temporarily improved by the irradiation, and in the majority of those who ultimately succumbed, life was prolonged and made more comfortable. For these patients, irradiation by radium is the greatest palliative ever placed before the medical profession, and offers a chance for cure even in those cases too advanced for operation. Bailey and Healy[22] record unsatisfactory end-results from irradiation in this class of cases. They state that in nearly every instance, cases subjected only to irradiations, evidence of the disease reappeared within a year.

Three-year cases too advanced for any form of treatment or who refused operation	10
Three-year cases too advanced for treatment	6
Three-year cases who refused treatment	4
Dead	10

A comparison of the hysterectomy mortality based upon all deaths occurring during the patients' stay in the hospital compared with that following radium irradiation shows the following results of the entire series of 115 cases:

Hysterectomies	68	Radium irradiations	32
Deaths	5	Deaths	2
Peritonitis	3	Myocarditis	1
Pulmonary embolism	1	Pulmonary embolism	1
Myocarditis	1	Operative mortality, all causes	6.2%
Operative mortality, all causes	7.3%		

In considering the relative mortalities from these two forms of treatment, the advanced stage of the cancer in many of the patients submitted to irradiation must be considered. Radium was employed in the majority of cases merely as a palliative. We would venture to state that had irradiation only been employed upon all cases, the operative mortality would have been materially lessened. Of the entire series of 115 cases, but seven were too advanced for any form of treatment, and an additional 8 cases refused to submit to treatment.

From the Crocker Institute, Wood and his coworkers have amply demonstrated the factor which is played by trauma in the dissemination of cancer. Many cases of fundal carcinoma present only vague symptoms during the early stages of the disease. The necessity of diagnostic curettage in these cases is obvious. The question, however, arises as to the part which curettage may play in the dissemination of carcinoma in this type of case and with a view to at least throwing some light on this phase of the problem, we have studied the cases in which hysterectomy has been performed alone or immediately followed by curettage, and compared these results with those secured from a group of patients in which a curettage was previously performed. In the latter group are included only cases in which the curettage was performed at least 24 hours or more prior to the hysterectomy.

Three-year hysterectomies only, or D. and C. immediately followed by hysterectomy.

Number of cases	35
Percentage alive	37.5

Three-year hysterectomy preceded by curettage 24 hours or more previously.

Number of cases	22
Percentage alive	40.9

The results in this series are actually in favor of those cases which have been submitted to a preliminary diagnostic curettage in the rate of 40.9 to 37.5 per cent. In considering these figures, it must be borne in mind that those cases which were submitted to an immediate hysterectomy, were as a group, more advanced, as naturally a diagnostic curettage would not be performed except in the case of a doubtful clinical diagnosis. At all events, this study seems to prove that a preliminary curettage is not markedly detrimental to the ultimate outcome. It is at least possible that a routine irradiation following the diagnostic curettage would even improve the results in the latter

group. Certainly had a diagnostic curettage not been performed, the diagnosis would have been delayed in many of the cases of carcinoma and the benign lesions could not have been excluded.

Whereas a panhysterectomy is indicated in all cases of carcinoma in which the uterus is to be removed, this has occasionally not been possible or in a few instances the malignant character of the lesion was not recognized until the specimen reached the laboratory. The latter has been the case in a few specimens in which the uterus was removed for myomata and a fundal carcinoma subsequently discovered. A comparison of these groups shows the following results:

Total number of 3-year hysterectomies	57	37.5 per cent alive
Total number of 3-year panhysterectomies	40	43.3 per cent alive
Total number of 3-year supravaginal hysterectomies ..	17	24.2 per cent alive

These figures indicate the importance of removing the entire uterus in this class of cases.

With only 34.8 per cent of three-year cures in our series, the necessity of early recognition of carcinoma is apparent. To attain this end in any group of cases, it will be found necessary to resort to diagnostic curettage in a relatively large proportion of cases. Even excluding the possibility of dissemination of the carcinoma by the curettage, any preliminary operation which occurs a day or two prior to the second operation has many drawbacks; the added discomfort, the mental effort upon the patient and the fact that anesthesia has to be administered a second time, all mitigate against this procedure. In a proportion of cases, however, this cannot be escaped. In a few cases when the amount of material secured at the curettage is large, a few of the larger portions of the specimen may be utilized for the freezing method. In general, frozen sections have not proved as reliable in our hands as paraffin preparation, and this is particularly true in the case of curettings. When only a small amount of curettings is secured, it is safer to rely upon a rapid paraffin method by which a practically certain diagnosis may be made in twenty-four hours. On the other hand, if the amount of tissue is considerable, one or two large pieces may be utilized for the freezing method. If these are found positive for carcinoma, it is safe to recommend that the hysterectomy be performed at once; if, however, the results secured by the freezing method are doubtful or negative, the final histologic diagnosis should be delayed until the paraffin sections have been examined. In passing, it may be stated that a careful macroscopic examination of curettings which have been thoroughly washed, placed in a small flat glass dish containing clean water and examined with a magnifying glass in a good light, is of distinct value.

Frank [23] states that gland recurrences in the lumbar, inguinal, iliac,

liver and lung metastasis are most common and that wound implantations in the perineal scar after Schuchard's incision, have been repeatedly reported (Hirsch[24] and Milner[25]). True vaginal metastases have been observed by Hellendahl.[26] In only two of our cases have metastases been observed in the ovaries and in only one in the tube. Whereas we are unable to give accurate figures, the majority of the recurrences have been pelvic. A possible explanation of this may be found in the theory of the origin of perforating hemorrhagic ovarian cyst advanced by Sampson.[27] If we accept that epithelial cell from the normal endometrium may be swept out through the fallopian tube and produce implantation growths in the ovary and adjacent structures, it is at least possible that a similar condition may occur in the cases of carcinoma cells originating within the uterine cavity. In only one instance have we observed a metastasis to the uterus from an ovarian carcinoma. This case is not included in our series.

Carcinomatous degeneration may occur in endometrial polyps. Among 104 endometrial polypi, we have observed three such instances. These have not been included in the aforementioned study. All the three are alive and with no evidence of recurrence. In the case of carcinomatous degeneration of an endometrial polyp, the most important points to determine from a prognostic viewpoint, are the condition of the pedicle and whether or not an implantation growth has occurred. One of our cases is so unique as to require special mention. The specimen consisted of a double fundus, one of which was small and atrophic, the other was the seat of an intramural myoma, the size of an orange, and contained a large tongue-shaped polyp, the distal half of which was the seat of an adenocarcinoma. In the posterior wall of the vagina, was a squamous-cell carcinoma 6 cm. in diameter. This is the only case in which carcinoma has been observed in malformed uteri, and the only case in which multiple carcinomata have been present.

CONCLUSIONS

1. Carcinoma of the body of the uterus is less frequent than cancer of the cervix. A possible explanation of this fact is that chronic cervicitis is a common lesion whereas true chronic corporeal endometritis is relatively infrequent.

2. Carcinoma of the fundus is a disease of advanced life. Over 71 per cent of patients, constituting the series under discussion, were 51 years of age or older.

3. Childbirth plays little part in the etiology of this neoplasm. In the present series 26 per cent were spinsters.

4. Hemorrhage and discharge are the most important symptoms. In 81 per cent hemorrhage was the first symptom. Pain, cachexia and loss of weight generally indicate an advanced and inoperable tumor.

5. With only 25 per cent of cases presenting themselves in the early stage and only 34.8 per cent of three-year patients alive, the importance of early diagnosis may be recognized.

6. Absence of pain and the nonrecognition of the significance of irregular bleeding account for the majority of advanced cases.

7. The histologic examination of curettings offers an almost certain means of diagnosis, even in the early cases.

8. The Clark test which consists in the passage of a sterile sound is of great practical value. Absence of bleeding following this test goes a great way towards excluding carcinoma. The test is an office procedure, and its more general adoption will result in the recognition of many early cases.

9. In the present series, the clinical diagnosis was correct and positive in 57 per cent of cases; the cancer was suspected in an additional 23 per cent, and in 19 per cent, the cancer was unsuspected.

10. In 75 per cent of the unsuspected cases, the symptoms resulting from cancer were masked by those produced by preexisting myomata. The combination of adenocarcinoma of the body of the uterus and myoma is a frequent one; 20.8 per cent of the present series of cancers were associated in these tumors.

11. The chief point of prognostic value is the integrity of the myometrium.

12. The duration of the symptoms has a direct ratio to the percentage of permanent cases. In cases in which symptoms were present for six months or less, 56.5 per cent were alive at the end of three years; when symptoms were present 7 to 12 months 31.2 per cent, and when symptoms had been present over one year, but 17.8 per cent were saved.

13. The treatment of choice is panhysterectomy and bilateral salpingooophorectomy.

14. Postoperative irradiations by radium of deep x-ray are of distinct value.

15. Radium irradiation is the greatest palliative and results in greater comfort to the patient and prolongation of life.

16. Radium irradiation offers a hope of cure even in cases too advanced for operation.

17. The percentage of three-year hysterectomy cures was 37.5 per cent, whereas in a like series, the irradiation resulted in 45 per cent of three-year cures. The result is probably due to the small number of cases comprising the irradiation group. A large group would probably show hysterectomy giving the better results.

18. The percentage of three-year hysterectomy cures in the early cases was 42 per cent.

19. The operative mortality from hysterectomy was 7 per cent and from radium 6 per cent.

20. The total mortality from all causes in the entire series of 115 cases was 56 per cent.

21. The total number of three-year cases was 86; of these 34.8 per cent are now alive.

22. Carcinoma of the fundus must be considered a relatively malignant form of cancer. The teaching that 60 to 75 per cent of these cures be permanent cures is, in our experience, fallacious.

23. Preliminary curettage plays little part in the dissemination, and its value as an early diagnostic procedure far outweighs any disadvantage accruing from its employment. Without diagnostic curettings, the majority of early cases would be overlooked or many normal uteri sacrificed.

24. Carcinomatous degeneration occurred in less than 3 per cent of endometrial polypi. All are alive. In these cases the important points are the condition of the pedicle of the tumor and whether an implantation growth has occurred.

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(*For discussion, see page* 625.)

SOLID OVARIAN TUMORS; THEIR PATHOLOGY*

By Samuel H. Geist, M.D., F.A.C.S., New York City.
Associate Gynecologist and Associate in Pathology, Mt. Sinai Hospital

IT is practically impossible to classify ovarian tumors into definite groups for neither clinically, anatomically nor pathologically can one always, with exactness, relegate a particular tumor to a special category. As Goodall said in a recent paper dealing with the histogenesis of ovarian tumors, the various classifications of ovarian tumors have not been as a rule histogenic, but rather topical, clinical or histological.

In this paper a clinical differentiation will be made, but overlapping must occur. Cystic tumors, that by the development and overgrowth of solid malignant portions become practically solid neoplasms, and solid new growths, that because of degenerative processes of various types become partially cystic, will be classified as solid tumors.

Pfannenstiel has classified tumors of the ovary most satisfactorily into parenchymatous and stromatogenous tumors. This same scheme can also be used for the solid tumors of the ovary.

Under *parenchymatous* solid growths would be included, the carcinomata and the cysts that develop carcinomata, either in their wall or papillae. The cystic portion may predominate in some instances, but for the sake of simplicity they will be considered in the solid class. Here also dermoid cysts that develop carcinoma, and the so-called solid teratoma may be included, though their histogenesis is somewhat different.

In the *stromatogenous* class are listed fibroma, fibromyoma, sarcoma of various types, endothelioma, angioma chondroma and myxoma. Many of these are rarities and the occurrence of others is open to much question.

Combinations such as chondro- and osteosarcoma are probably one-sided developments of teratomatous growths.

The solid tumors as a group are less frequent than the cystic ones, but like the cystic growths may have papillary excrescences on the surface, and may have a complete capsule or one that is often perforated, if the tumor is malignant. The solid tumors are less often pedunculated than the cystic, and the malignant ones most infrequently so. There is a tendency to involve the entire ovary, but to maintain its outline for quite a long time.

*Read at a meeting of the New York Obstetrical Society, December 11, 1923, as part of a Symposium on Solid Ovarian Tumors.

Of the epithelial or parenchymatous new growths of solid nature practically all are malignant or potentially so. Carcinomata of varying types occur as the most common tumor of this variety. They comprise from 15 to 20 per cent of all ovarian tumors.

They are often bilateral, Kelly finding this to be so in 36 per cent of the cases. Pfannenstiel quotes 90 per cent as the figure, but this, of course, includes the cases that develop involvement of the second ovary at a later period. In other words this high figure means involvement of both ovaries but not of necessity simultaneous involvement. Others state that in 50 per cent of the cases coming to operation both ovaries are involved.

The average age of occurrence is from 45 to 55 years though they may occur even in children. This is especially so of the solid teratomata. The extreme age limits for carcinoma are from 4 to 69. There have been 15 cases of true carcinoma recorded that developed before puberty.

Grossly the solid carcinoma may present as a small or medium sized ovoid or rounded, slightly nodular or lobulated mass. It is often encapsulated, though the capsule may show defects through which the tumor may grow to implant itself on contiguous surfaces and adjacent organs. Commonly these tumors are surrounded by adhesions, either fibrous alone or containing malignant cell masses. These adhesions probably form early in the development of the tumor because of the mechanical and possible chemical irritation of the neoplasm to the peritoneum.

The three common types of carcinomata are the medullary, the adenomatous and the scirrhous. A papillary development is not unusual, 50 per cent of the papillary types being adenocarcinoma. The simple or papillary cyst, that develops a carcinoma in its wall or papillae, is a much less malignant tumor than the solid carcinoma with degenerative cyst formation.

On section the medullary tumors are soft, brain-like in consistency, pinkish or yellowish white in color with areas of hemorrhage and necrosis giving a variegated appearance to the cut surface. There are often areas of liquefaction with the formation of fairly large sized fluid collections. They may be typical degenerative cysts with a shaggy or smooth wall, occasionally epithelial lined. Now and then one finds areas of calcification which gives a gritty feel to the cut surface, the psammoma type of tumor.

In the adenomatous group the cut section, too, is soft and cellular with small and large sized cavities containing a thick viscid fluid rarely pseudomucin. Where pseudomucin is present the probability is that we are dealing with a carcinoma arising in a preexisting pseudomucinous cyst.

The scirrhous type often resembles a fibroma. The white fibrous cut

section and the hardness of both these tumors make it difficult to distinguish the two at times. In fact these scirrhous tumors have so low a grade of malignancy that they are often an accidental finding in elderly women.

The same general features of gross appearance and cut section as described above, apply to solid carcinoma arising in a cyst or dermoid tumor. In the cysts one commonly finds either in the wall or papillae the solid malignant tumor development.

Histologically the medullary type presents a rather scanty stroma with masses and solid nests of irregular large atypical rapidly dividing epithelial cells. Here, as in the papillary carcinoma, epithelial metaplasia to a squamous cell type is found.

In the adenomatous group masses of irregular atypical infiltrating glandular structures are seen. The cells typically malignant, many layered and dividing, penetrate the basement membrane and invade the surrounding ovarian stroma.

In the less malignant scirrhous forms one finds a fibrous tissue stroma with scattered islands, strands and rows of small atypical cells.

A rather atypical solid tumor classed by some as malignant is the so-called folliculoma. This really arises from the original germinal epithelium as a small white tumor rarely growing to a large size. In most cases only a portion of the ovary is involved. It has a tendency to form alveoli of large polygonal cells with the suggestion of mimicing a true follicle. There are areas of liquefaction with degenerated cells resembling true ova and occasional extensive epithelial lined cyst formation. The ova-like cells are also found in medullary carcinomata but true ova have never been definitely proved to exist in carcinoma.

Metastases of solid epithelial tumors are often found in the omentum, pelvic or abdominal organs, and on the peritoneum. While this also may take place in the more benign papillary adenomatous cysts, these latter metastases are all surface contact implantations, and not infiltrating transportation deposits. The lumbar, iliac and supraclavicular glands may be involved also.

The frequency of bilateral tumors is due not so much to primarily bilateral ones, that is a multicentric origin, as to the later involvement of the second ovary either by contact or by peritoneal and lymphatic transportation.

In unilateral cases of malignancy 50 per cent recur while in bilateral cases 89 per cent have recurrences. Pfannenstiel states that 66 per cent of all malignant solid ovarian tumors recur. It is interesting to note that in many instances the remaining ovary has subsequently become involved, even when at the time of operation it seemed, at least grossly, uninvolved. Recurrences may take place in the stump,

the wound, the peritoneum or the remaining pelvic viscera. Such recurrent tumors have been described as occurring as late as twelve years postoperative. In about 15 per cent of the cases with complete operation an absolute cure is achieved. In those cases where glands are involved an attempt to extirpate them is useless, as the inaccessible ones are also involved. Often when the case comes to operation the lymph nodes are already involved.

Secondary ovarian carcinoma is common. Many of the bilateral carcinomata of the ovary are really metastatic tumors with a primary focus either in the gastrointestinal tract, the breast or other organ. When the primary tumor is in an intraperitoneal organ one may get metastases in the ovary by direct extension, peritoneal implantation, lymph or blood stream transportation. The dependent position of the ovary in the abdomen, its circulatory variations due to functional activity, and the surface trauma due to ovulation may predispose to implantation.

These secondary tumors appear first as small surface nodules which may reach the size of an orange. The shape of the ovary is often maintained. A capsule may be present which may either be intact or perforated by tumor.

On section these growths are edematous, translucent and waxy, and some, especially those from the gut, may have a papillary appearance. A typical Krukenberg tumor microscopically shows a sarcoma-like edematous connective tissue, containing spindle cells of varying sizes with variations in tinctorial properties and other signs of malignancy. A very characteristic form of cell is the seal ring type. It presents a large cell body containing a mucoid protoplasm with a small eccentrically placed nucleus. This type of tumor is rather distinctive, but in practically every instance is metastatic, the change in the structure of the tumor being due possibly to the variations and peculiarities of the ovarian circulation due to its functional activity. While a few may be primary, a most careful autopsy is necessary to rule out the possibility of a parent growth in some other organ. Other metastatic ovarian carcinomata resemble in the main the primary growth. While a metastasis may occur in a cyst, a carcinoma developing in a preexisting cyst must be classed as a primary tumor.

The symptoms of solid ovarian carcinoma are rarely characteristic. Rapid growth is associated with all of them especially the medullary type and a preexisting cyst that suddenly enlarges in size suggests a malignant transformation.

Ascites is also commonly associated with solid ovarian tumors, benign as well as malignant, and may reach a rather marked degree. In carcinoma it is often bloody. The cause of this ascites is speculative. Chemical and gross mechanical irritation of the peritoneum

and possible circulatory embarrassment have been given as explanations. Menstrual disturbances are not common.

Teratoma may be classed as a solid epithelial tumor though it is neither, strictly speaking, solid nor purely epithelial. Its origin is from a totipotential blastomere, one that has the latent developmental ability to reproduce all forms of tissue corresponding to the three embryonal layers. It is a rare tumor and has been described in children and adults, but no case has been described in a woman who had reached the menopause.

Macroscopically they are unilateral, pedunculated and nodular tumors that may weigh as much as 50 pounds. They grow extremely rapidly. On section they show solid and microcystic areas, papillary growth and a variegated color scheme.

Histologically one finds all types of developed tissue with a myxomatous and sarcomatous stroma. The cells and their conglomerations that form tissue, for the most part, are unripe. Often one finds typical adenocarcinomatous areas as atypical variations of the glandular elements in the growth.

Cystic spaces occur, lined by skin and mucosa, and true adenomatous areas can be identified suggesting gastrointestinal mucosa. Embryonal tissue-like sarcoma, epithelial structures and malignant adenomatous areas are indiscriminately jumbled together to make an unorganized accumulation of developed tissue, embryonal structures, cysts and malignant areas with true bone and cartilage.

Often there is found an overgrowth of chorionic epithelium of both Langerhans and syncytial cells resembling true chorioepithelioma.

In solid teratoma the mortality is 85 per cent. Superficial dissemination over the peritoneum and retroperitoneal involvement takes place. The metastases are by implantation or lymphatic extension and may be simple structures or teratomatous like the parent growth.

In several cases in young children the tumor has been associated with precocious puberty. In one case after the removal of the tumor the signs and symptoms of maturity disappeared. The other symptoms are those of any ovarian malignant tumor.

Another rather rare and peculiar solid tumor has been described as struma ovarii. It is believed to be a one-sided development of a teratoma. Its structure is like the typical thyroid and it contains both colloid and iodin. It is malignant, produces ascites and forms metastases.

The *stromatogenous tumors* include the great group of connective tissue neoplasms both benign and malignant. Under the benign stromatogenous growths the fibromata and fibromyomata are the most common type. Rarities such as angiomata chondromata and osteomata have been described.

Fibroma and fibromyoma are not common, comprising about

1.3 to 2 per cent of ovarian tumors. Grossly they resemble each other. They are hard, diffuse tumors, rounded or lobulated, that replace the ovary but maintain its shape. They may be peduncular. The very small ones may appear as flat or papillary surface tumors. These fibromata, unlike the uterine type, cannot be enucleated. They are hard, rounded occasionally encapsulated tumors. On section they have a pearly white or pinkish cut surface with a coarse fibrous whorl-like appearance. The myomatous ones show areas of glistening, translucent grayish muscle. If there has been torsion of a pedicle there is hemorrhage, which gives to the cut surface a varying color scheme.

One finds areas of necrosis and calcification that grossly appear yellowish and feel gritty. True bone formation is found in them but here one must differentiate between this bone formation and the bone of a teratoma with true periosteum and marrow. Degenerative processes with liquefaction and cyst formation are not uncommon. Occasionally one finds these fibromata in the walls of simple cysts.

The age of occurrence varies from 8 to 83 years. They are commonest between 40 to 50 and are usually unilateral, though 20 per cent are bilateral. They may grow very large, in fact one has been reported that weighed 90 pounds. The rate of growth, however, is very slow. The symptoms are not characteristic. Rarely are there menstrual symptoms except when the tumors are bilateral and replace entirely both ovaries. In these instances amenorrhea is present. The other symptoms are those associated with pressure and the presence of a large pelvic tumor. Ascites is also common in large tumors. Forty per cent of the cases have this symptom; bloody ascites is found only if the tumor is twisted. The prognosis is good.

The stromatogenous malignant tumors include all the sarcomata of which there are many varieties and combinations. They are not common tumors, forming 2 to 5 per cent of all ovarian tumors. They are grouped as fibro, spindle and round cell sarcoma as the primary types. In addition the rarer varieties, such as angiosarcoma, endothelioma, chondrosarcoma, osteosarcoma have been described.

They may be, and usually are, primary tumors though they may also arise as a degenerative change in a fibroma or as a metastasis from some distant or contiguous primary focus. Such metastatic growths are rarer than the primary tumors. The average age of occurrence is 32 years though 40 per cent occur in patients under 25 years and cases have been reported in children and even in the fetus. In 30 per cent of the cases the tumors are bilateral, not as frequent, however, as in carcinoma. The round celled type is most frequently bilateral.

Grossly these tumors resemble the benign type of stromatogenous tumor. They are solid, smooth or slightly nodular tumors which, while they grow more rapidly than the benign tumors, like them,

tend to maintain the shape of the ovary or mimic a kidney in gross outline. They may be pedunculated. If fibro- or spindle cell sarcoma they are hard. The consistency depends on the fibrous tissue content of the tumor. If round cell in type they are soft, friable, brain-like in consistency. The cellular round cell type often resembles medullary carcinoma grossly.

The cut section is pinkish or yellowish white in color. Often they show areas of punctiform hemorrhage or larger hemorrhagic zones with yellow, lutein-like patches of necrosis. Here and there are areas of liquefaction with large dilated vessels and lymphatics, the latter looking like tiny elongated cysts with straw- or clear-colored serum in them. Again there may be a marked edema, giving the cut surface a gelatinous appearance. Cystic degeneration, with the formation of large sized cavities, is not unusual. Occasionally one finds an epithelial-like lining to these cysts.

Microscopically one gets round, spindle and polymorphous celled tumors with giant cells, either mono- or polynuclear. There are also the mixed forms such as myosarcoma, containing atypical muscle cells, and chondro- and osteosarcoma. Where true bone and cartilage is found it is often difficult to rule out the possibility of a one-sided teratoma.

Spindle cell tumors are slow growing with irregular sized cells of varying and atypical forms. The nuclei are likewise bizarre in shape and show marked variability in their avidity for stain. The cells are often multinuclear. Of course there are variations between the benign, but cellular fibroma, and the more benign type of fibro- or spindle cell sarcoma.

The fibromyomata also resemble the spindle cell sarcoma, but the muscle cells in the myomata are usually larger, the nuclei small and more rod-like than the spindle cells of a sarcoma. In the myosarcoma, however, one gets true malignant cells which differ from the normal muscle cells above described and approximate those of the typical sarcoma. The spindle cell type presumably arises from the stroma.

The round cell tumor is softer than the spindle cell variety and more cellular. The cells vary in size and shape but the majority favor the more unripe round type than the spindle cell group. Here, too, cystic spaces are seen and all the changes of hemorrhage, fatty degeneration necrosis and myxomatous transformation are encountered. These tumors grow more rapidly than the other forms of sarcoma. This type has its origin possibly from the perivascular areas and is most malignant. It seems to be almost a rule that the softer the tumor the more unripe the cells, and the more unripe the cells the worse the prognosis.

Other types of sarcoma such as angiosarcoma are rare. The endotheliomata are classed by some as angiosarcoma both hemangio-

sarcoma and lymphangiosarcoma. These angiosarcomata are malignant, solid nodular tumors and extremely cellular. The cells are small, round, arranged in alveoli with a tendency to group themselves about the vessels. They occasionally have a myxomatous stroma. Some of the tumors have chains of small cylindrical cells with a more fibrous stroma.

Metastatic or secondary sarcomas of the ovary are rare. Melanosarcoma occurs as a part of a general dissemination of this particularly virulent neoplasm. The secondary ovarian tumors are deposited either through the peritoneum, by direct contact from neighboring organs or by blood and lymph transportation. The more cellular the tumor the more malignant it is, just as in the primary growths. Occasionally the metastatic tumors are bilateral but not as commonly as in metastatic carcinoma.

In fibrosarcoma the prognosis is good. In the round cell type it is bad, as this form grows rapidly, metastasizes most frequently and recurs most often. In young children there may be some signs of precocious puberty such as the enlargement of the breasts, increased hair growth in the pubes and axilla, rarely menstruation.

The symptoms of both primary and secondary tumors show nothing specific. The symptoms are due to disturbed ovarian function, to the size of the tumor, and to the complications attending it, such as necrosis, hemorrhage, incarceration, infection and rupture. Seventy per cent have ascites which may be bloody, particularly if there is a twist of the pedicle. In the instances where the entire ovarian parenchyma is destroyed amenorrhea is present.

It is interesting to note that the functional disturbances of the ovary, while uncommon, may be of any type. In 75 per cent of the cases the menstrual cycle is normal.

Sterility is not the rule and often the presence of a pregnancy adds an extra menace, as the tumor may offer an insuperable obstacle to a normal delivery, necessitating operative interference. On the other hand pregnancy may predispose to some of the more annoying complications.

Torsion is the most common accident. It occurs in about 15 per cent of all cases. It may occur in children. It commonly affects the medium sized tumors. As a result of torsion there are numerous secondary changes such as hemorrhage, gangrene and rupture, all of which give special indications for operative interference.

Appended is a brief resumé of the 50 cases of solid ovarian tumors studied.

There were 31 cases of carcinoma; the ages varied from 12 to 65. Twenty-four cases had primary tumors and seven secondary. Of the primary tumors six occurred in preexisting cysts; in one of these latter cases there was a rupture of the cyst pre-operatively. These

were all papillary adenocarcinoma. Of the remaining eighteen, 12 were papillary adenocarcinoma and 6 were medullary. Three cases died shortly after operation, one of peritonitis. In 10 cases, at the time of operation, there were already abdominal and omental metastases present. Most extensive metastases were found in the two youngest cases, 12 and 13 years respectively.

The symptoms were not characteristic, and in only three instances was there a disturbance in menstrual function. In one case there was a history of profuse periods every three weeks, in a second instance spotting for one month, and in a third, irregular intermenstrual spotting for three months.

The older women had had a normal menstrual history, and then the menopause. There were 14 cases with ascites, in 10 instances bloody. In 11 instances the tumors associated with ascites were papillary adenocarcinoma, in two medullary, and in one a typical Kruckenberg. In five instances there were pelvic recurrences in 6 months. Unfortunately the follow-up was not complete.

There were 4 instances of carcinoma occurring in dermoids; three were squamous, one was medullary. The ages varied from 35 to 50 years. One died of peritonitis postoperatively and three made operative recoveries. One subsequently developed lung metastases in a few months. In two cases the cyst had been overgrown and perforated, with involvement of the intestine. In only one case was the menstrual period changed, and that but a slight increase in the amount. The chief complaints were, as in the carcinomata, pain, an abdominal mass with rather sudden increase in size.

There was one case of a solid teratoma in a woman thirty-one years of age. She had noticed a mass for two years which, at time of operation, was the size of a fetal head. She made a good recovery.

There were nine cases of sarcoma. Six were fibrosarcoma, two round cell, and one perithelial sarcoma. One of the round cell tumors was inoperable, and the other had local recurrences in six months. The age variations in the nine cases were from 25 to 56 years. There were no characteristic symptoms; the chief complaints were pain and the presence of a mass. In only one case was there a menstrual disturbance, and that only a slight increase in the amount of flow at the time of operation. Six of the cases had ascites and in three of these the tumor was twisted.

Of the benign tumors there were seven cases; five fibromata and two fibromyomata, the ages varying from 20 to 62 years. They all made operative recoveries.

In two cases there was a history of profuse menstruation and in one woman of 40 there was a history of one year's amenorrhea. The chief complaint here was also an abdominal mass and pain. In four

instances the tumors were twisted, and in two of these ascites were present.

The clinical data were obtained from the Gynecological Service (Dr. Brettauer) Mount Sinai Hospital.

The pathological material was made accessible by Dr. F. S. Mandlebaum, Director of Pathological Department, Mount Sinai Hospital.

The literature has been ably compiled by: Pfannenstiel in Veits' Handbuch der Gynäkologie, Frank in his Monograph on Gynecological Pathology, Lynch in the Monograph on Pelvic Neoplasms.

300 CENTRAL PARK WEST. (*For discussion, see page* 621.)

SOLID TUMORS OF THE OVARY; THEIR CLINICAL CONSIDERATION AND TREATMENT*

BY ELIOT BISHOP, M.D., BROOKLYN, N. Y.

(From the Department of Gynecology and Obstetrics of the Brooklyn Hospital)

LITTLE more than a year ago, I had a minor part in a tragedy of the operating room, indeed, a place where tragedies are none too rare. A girl, nineteen years old, of great promise from her intellectual and social position in the community, was being operated upon for a pelvic tumor. Her surgeon, a most distinguished gynecologist for more than a generation, had, as observing consultants, her family physician, an internist of international fame, and another gynecologist of note. A large solid tumor replacing the entire ovary of one side was found, and in the other ovary, was a solid tumor sufficiently large to be perfectly definite.

These three distinguished men gave pause before they would pass final judgment. Complete pelvic extirpation was elected, and each tumor was reported a carcinoma of the ovary by competent pathologists. Today this girl is alive and well. Why did these men of such great clinical experience hesitate? Malignancy of the cervix, or corpus of the uterus or of the external genitals, is quite readily recognized and, with minor differences, the treatment is fairly well standardized. In the ovary, however, the responsible operator faces three choices, the possibility of a solid tumor being a benign growth, such as a fibroma, or a cystadenoma to be met with removal and resultant return to health, the possibility of malignancy with operation and complete loss of sexual function in the largest sense, or the possibility of malignancy with attempt at conservatism with probable recurrence.

Few men are more familiar with abdominal neoplasms than Bland-Sutton, and yet he writes in Keen's *Surgery:* "Solid ovarian

*Read at a meeting of the New York Obstetrical Society, December 11, 1923, as part of a Symposium on Solid Ovarian Tumors.

tumors have puzzled pathologists and surgeons on account of the great difficulty of detecting specific differences in their minute structure *even with all the resources of histological chemistry* which would enable distinction to be made between (for example) the harmless fibroid and a spindle-cell sarcoma."

Williamson and Barris, in Eden and Lockyer's *System of Gynaecology,* refer to the difficulty of distinguishing between papillomatous and carcinomatous ovarian cysts.

Our American textbooks are far from satisfactory. A survey of the older works extending back to the original classic of Edmund R. Peaslee on *Ovarian Tumors,* through the writings of H. C. Coe in the '80's and '90's, and then to the somewhat more modern work of Garrigues on *Diseases of Women,* showed, as we should expect, a good deal of confusion as to classification and the clinical consideration of this subject.

A. J. C. Skene writing in the Kelly-Noble *Gynecology and Abdominal Surgery* (1907) gives little space, even in this comprehensive work, to the subject, for from it we obtain the idea that, even in the mind of this master, there was confusion regarding diagnosis, as he tells us that cystic adenomata and cystic sarcomata present no diagnostic characteristics on physical examination.

Based on modern pathology, Crossen, *Diseases of Women,* gives a surprisingly small amount of space to the subject. We can practically dismiss it as a reference work after we get from it the following facts: he feels that the gross classification is the simplest; and that solid tumors represent about 5 per cent, and among these, fibromata are frequent and small in size. Of malignant growths, sarcomata are the most frequent, and both ovaries are usually affected, while carcinoma is usually secondary to a papillary cyst, and both ovaries, again, are affected in the majority of cases. As to diagnosis, I will quote him literally: "Owing to the rarity of solid tumors of the ovary, and the absence of distinctive symptoms, the diagnosis is usually made only after the abdomen is opened." Concerning treatment, he inadequately advises "removal."

Robert Frank, in his monograph on *Gynecological and Obstetrical Pathology* (Appleton), has collected more facts on ovarian tumors than any other work that I have covered, and I shall take the liberty of later quoting rather freely from him, as well as from Graves, who, in the latest edition of his book, gives us the most complete survey of ovarian tumors with more pathology than any other general clinical work.

Brooke Anspach, in his recent *Gynecology,* is very practical in discussing treatment, and to it I shall refer later.

The German literature with its wealth of material, has an attitude of more authority, and yet the most modern exposition of this sub-

ject by the great gynecologic pathologist, Oskar Frankl, shows us we have an undetermined field.

Current literature is replete with much specific material on this subject, even to the point of confusing the confused, and from it I shall try to bring in what matter I can, from which to draw, if possible, some worth-while conclusions.

Having referred to the indefiniteness in the literature, let us ask ourselves; "What is the subject in hand?" The crux of the matter is—do we know a malignant tumor when we see it, and feel it and section it; and again,—if we are confident or even suspicious that we are dealing with a malignant tumor, what will we do, not with *it*, but with the other pelvic organs?

This question has been asked this Society before. At the meeting on November 14, 1916, Dr. Frank Oastler reported three cases of ovarian cyst and queried "What constitutes malignancy in an ovarian cyst?" We all know that among the solid tumors, the proportion of malignancy is much greater. Dr. L. W. Strong gave the most scholarly answer, naturally speaking from the laboratory standpoint. He made one point that is useless clinically, even to the point of exasperation, yet we must admit it as true; "there is a stage where a thing obviously *not* a *carcinoma* is becoming a carcinoma!" Brooks Wells, H. J. Boldt, H. N. Vineberg, H. D. Furniss and LeRoy Broun took part in the discussion, and yet there was no unanimity of belief; the only rule they all followed, except Dr. Broun, was that every ovarian tumor should be removed *in toto*, with no tapping or morcellation.

As the reader of the previous paper has inferred,* classification of ovarian tumors on a scientific basis is unsatisfactory, and, in this view, he is supported by such men as Adami and Nichols, R. T. Frank and Graves, the two former admitting that the method of the older writers of dividing them into cystic and solid growths is a fairly good classification. Peaslee classified the solid growths not so antiquely as we might suspect, when one considers it was published in 1872. Anspach, omitting retention cysts, classifies all new growths of the ovary as epithelial, connective tissue or combined epithelial and connective tissue, but in each of the groups, he finds benign and malignant. Eden and Lockyer classify an ovarian tumor as innocent or malignant.

MacCallum feels that the differentiation of epithelial growths, as to their chemical contents, pseudomucinous or serous, is of no great importance; this in the face of the fact emphasized by Ewing and supported by practically all, including Graves, that pseudomucinous cystadenomata much less rarely develop papillomata than do serous cystadenomata and the latter much more frequently become carcinomata.

*See page 567, Geist paper.

In this light, to quote from Graves, "We may then invoice them as solid tumors for they are in the same clinical relation to the patient as genuine carcinomata of the ovaries."

Thus, then, we must ask the indulgence of the Society when we consider that solid tumors consist of cystomata which have become papillomata, genuine carcinomata and dermoids and their histologic cousins, teratomata, which, by the way, while quite rare are very prone to a vicious malignant degeneration, while dermoids very rarely become so. Oskar Frankl, in 1920, collected only sixty cases from all the literature. In addition to these, we have the connective tissue growths, fibromata, fibromyomata, sarcomata, endotheliomata, etc.

If we are going to look for any clinical guide posts, we must consider the frequency first, of all ovarian tumors, and then that of solid tumors. At the Brooklyn Hospital from 1908 to 1923 (inclusive), there was encountered a total of 333 ovarian tumors. Of these there were:

Cystomata	237	or 71.1 per cent
Dermoids	24	or 7.2 per cent
Malignant cysts or carcinomata	34	or 10.2 per cent
Benign papilloma	27	or 8. per cent
Sarcomata	2	or 0.6 per cent
Fibromata	5	or 1.5 per cent
Myomata	1	or 0.3 per cent
Endotheliomata	1	or 0.3 per cent
Teratomata	1	or 0.3 per cent
Krukenberg tumors	1	or 0.3 per cent

Ewing considers that serous cystadenomata form one third of the cystic tumors. Pfannenstiel believes 50 per cent of papillary cystic tumors reveal adenocarcinomatous structures in at least some portion of the growth; while pseudomucinous cystadenomata form the majority of the cystic tumors—they rarely become carcinomatous.

In 200 cases of Martin and Libbert the proportions were as follows:

Cystadenomata	55 per cent	
Carcinomata	22 per cent	
Embryomata	9.2 per cent	(including dermoids)
Parovarial	8.4 per cent	
Sarcomata	2.9 per cent	

Erdmann and Spaulding, in 1921, surveyed 200 cystomata of the ovaries and found 36, or 18 per cent papillary; these figures are not far from the average of many observers, Coblentz giving 10 per cent and Martin and Libbert 27.5 per cent. Of the 36 cases of Erdmann and Spaulding 24 or 66.6 per cent were malignant. Ewing believes that 10 per cent of all ovarian tumors are dermoids.

Among the connective tissue tumors, we again find wide variations as to the frequency. The lowest figures are 1 per cent for fibromata in Eisenstaedter's group; 1.5 per cent at the Brooklyn Hospital in a large series of cases; 2.5 per cent reported by Meigs of Boston, in 1922; and 3.5 per cent by Hoon in 1923 from 4175 ovarian tumors in 11½ years at the Mayo Clinic and Ewing quotes 5 per cent from Kroemer. On the other hand Strong, in discussing a case reported by Dr. A. M. Judd before this Society in October, 1920, said that "fibromata were the commonest solid tumors, even more frequent than sarcomata, which are 5 to 10 per cent of all ovarian tumors." Another unexpected statement, in the same discussion came from Dr. Herman Grad, who said that he had had only one case of solid ovarian tumor and that was one of bilateral sarcomata. Joseph T. Johnson of Washington reported that among 5,000 laparotomies he had found but one fibroid tumor of the ovary. H. C. Coe covered the subject of fibromata over forty years ago, and Reuben Peterson reviewed 82 cases, 21 years ago, but statistics have changed so much since then that these figures are of little value.

Regarding the frequency of sarcomata, we again find wide variations; the rare incidence of 0.5 per cent, in Eisenstaedter's series, 0.6 per cent at the Brooklyn Hospital, 1.5 per cent in Adami and Nichols *Pathology*. Frank gives their frequency at 2 to 5 per cent, Graves says they are very rare, while Miles Porter of Indiana, in a large practice of abdominal surgery feels that they occur in 5 per cent at least. He quotes Bland-Sutton as finding 21 in 100 cases of ovariotomy in young girls.

The other solid tumors, myomata, myxomata and teratomata are so rare as to be negligible in figures.

Of all malignant cases of ovarian tumors, there is, then, a good deal of variation. Bland-Sutton feels that 20 per cent are malignant, Miles Porter agreeing with him. Bertino reports 17 per cent among nearly 470 cases of ovarian tumors, while at the Brooklyn Hospital we found less than 12 per cent. Frank reports primary cancer of the ovary in 10 to 12 per cent, but he must feel that many more secondary cases exist from his radical advice as to treatment.

As to the occurrence of epithelial tumors, Ewing says "all ages are susceptible from birth to senility, but the period of sexual activity, 25 to 35 is most prominent." Most of the carcinomata occur, though the case referred to in the opening paragraph was 19 years old, between 40 to 50 years. This is borne out by many case reports.

Teratomata occur in all ages, most frequently between 30 to 40 years, though often in children, R. H. Harris reporting a case of carcinomatous teratoma in a child six years of age.

In Hoon's review of 55 out of 149 ovarian fibromata, found at the Mayo Clinic, the greater number occurred in the fourth, fifth, and

sixth decades, but the youngest was 18 and the oldest 73. In my own survey of the more recent current literature, these facts seem to hold.

When we consider the occurrence of sarcoma, we then find wide variation in the reports, Downes operating upon a nine months old baby, and one case being reported as found in a fetus. In general, they occur in the young, one out of the two at the Brooklyn Hospital being 13 years of age. Judd reported one before this Society of a girl 16 years of age. It is a very noticeable fact that the standard textbooks of gynecology or pathology give little space to the connective tissue tumors.

Tumors of the uterus and inflammatory conditons of the pelvic organs have a good deal of sameness in the stories presented, especially as to menstruation.

The symptomatology of solid ovarian tumors is again a maze of variability. In the case of R. H. Harris, puberty occurred at five years of age; after the removal of the affected ovary menstruation stopped and did not recur, though the malignancy did 30 months later. This was a teratoma, which is very rare, and includes all three elements of embryonal tissue.

Among the epithelial tumors, Corcia reports in the case of a large papilloma, six months amenorrhea, while others, too numerous to mention, have found menorrhagia and metrorrhagia.

Foerster of Philadelphia reviews 12 cases of his own of connective tissue tumors of the ovary, and found amenorrhea as a prominent symptom, sometimes of several years standing, which, to him, "indicated plainly that the ovary was unable to perform its function."

In Hoon's survey of the 55 cases of fibromata from the Mayo Clinic, he reports that "menstruation is seldom influenced by the tumor."

Going to the other extreme, we find that Fairbairn of London in five very carefully surveyed cases of fibromata finds usually some menorrhagia. Miles Porter in his series, found amenorrhea, menorrhagia and metrorrhagia; amenorrhea occurring in a malignant tumor when bilateral. Leo Schwartz' patient with sarcoma had no menstrual disturbance. Judd in his case of sarcoma reported metrorrhagia, but only for a month.

When we consider pain, again we find great variation in reports, irrespective of their being epithelial or connective tissue tumors. A patient is driven to the gynecologist by the pain of a simple cyst, and yet a malignant tumor is often found from some other symptom, or by chance at operation. Porter usually found pain, and Fairbairn reports simply a dull ache. Leo Schwartz' case of sarcoma of the ovary had only pain as a symptom and that for only four months.

Dysuria, at least to the degree of urgency and frequency and pain, was as common a symptom as I could find. This, however, is explained satisfactorily by the pressure of a hard and frequently heavy mass upon the bladder or ureter.

As frequent a symptom as is reported, is the patient's complaint of increase of size. In the epithelial and in the malignant connective tissue tumors, this is much more rapid than with the fibromata.

The differential diagnosis of solid ovarian tumors from cystomata or from other pelvic growths is not always so hard as the differential diagnosis between benign and malignant solid growths of the ovary.

It would be in the nature of a presumption to fill a paper before this Society with methods of bedside examination and diagnosis. The only caution I wish to bring out is actuated by the lecture of Oskar Frankl before the Royal Academy of Medicine in Dublin in April, 1922, and published in the *Medizinische Klinik* that same year. In that discourse, he states that the frequency of metastatic tumors of the ovary is so great and it so often is so much larger than the primary tumor, that as gynecologists we must carefully consider before an operation upon a pelvic tumor in a woman who has gastrointestinal symptoms. The converse of this caution is advised to the surgeon of the upper abdomen, for the best gastrectomy is of little avail, if particles are dispersed into the ovary.

With the abdomen opened and an ovarian neoplasm visible, palpable and even sectionable, is it possible always to make a diagnosis?

Let me quote from authorities. In discussing a case of sarcoma in the puerperium, reported by Dr. George Brodhead, Dr. George Kosmak said, "In most cancers, the diagnosis is not made until the pathologist's report is received." But is it always then? In April, 1919, the writer removed an apparently solid tumor of the right ovary and it was reported "cystadenoma; no malignancy found." Fourteen months later a tumor of the left ovary with the rest of the pelvic contents was removed, and the report was returned "cystadenoma, undergoing malignant changes." In spite of x-ray therapy, immediately instituted, she died in about a year with an extensive pelvic mass with probable hepatic involvement.

With the abdomen opened, the first observation is made as to ascites. This is not an accompaniment of only malignant tumors, for many authors report it otherwise. For instance, in Eden and Lockyer, we are told it "is formed with large innocent tumors and some varieties of cysts; it is also a common concomitant of papillomatous tumors. Conversely, in malignant tumors, especially those which have not spread beyond the ovary, it may not exist." Graves says it is always present with sarcomata, but it is not a special mark of malignancy, because it is usually present with all solid tumors of the ovary. Miles Porter has found it the rule in malignancy, but not oc-

curring frequently in benign tumors of the ovary; it is present whether malignancy involves the peritoneum or not, and he wonders if it may not be due to increase of peritoneal tissue.

Until we know more of the causation of ascites, it cannot be a reliable symptom. Pfannenstiel ascribes it to a chemical irritation of the peritoneum and Schauta considers it to be due to pressure and stasis of the blood vessels of the parametrium. With these authorities bringing forth views which, while not actually disagreeing, fail so much to coincide, we may only look on ascites with suspicion, with possibly more suspicion if it is blood tinged.

Having considered, with or without satisfaction, the condition of ascites, the operator must note adhesions. Here, there is more unanimity of opinion. If the tumor is yet confined to the organ, with unbroken capsule, adhesions will be rare, whether or not the growth is malignant, but they will develop early if the tumor tissue breaks through the capsule whether it is malignant or benign. Pedunculation, again, is a characteristic that seems indeterminate upon either the malignancy or innocence of tumors.

The physical character of the ovarian tumor itself is of the greatest importance, and is extremely difficult to properly evaluate. In size, there are wide variations reported, especially in fibromata—from those no larger than the ovary itself to two reported before the Obstetrical Society of Philadelphia in April, 1914, one by Outerbridge, the size of an adult head, and one by Laws, the size of a full term pregnancy.

Bertha Van Hoosen reported to the Chicago Gynecological Society a rare case of melanosarcoma, which also had attained the latter size. Judd's case of sarcoma was the size of a grape fruit.

The cystomata that have become physically solid through development of papillomata may attain size limited only by capacity of the abdomen. Indeed, there have been instances in which the papillomata grew up through the diaphragm and down into the vagina!

Their consistency varies as do all the other data about solid tumors. Many have become so cystic through degeneration or liquefaction that they show fluid contents, and merely a shell, while MacCallum says he "has more than once observed bilateral multilocular ovarian cystadenomata composed of such small cysts that the tumors appeared to be almost solid." If pathologists are puzzled by these, what may be expected of clinical surgeons in the hurried tension of the operating room? This same pathologist tells us that the gelatinous contents of some of these definitely malignant tumors resemble the pseudomucin of some adenocystomata!

Serous cystadenomata become physically solid when papillae develop as they do much more commonly than in the pseudomucinous variety. These papillae appear on the surface of the tumor, and give implanta-

tion metastases over adjoining peritoneum. Malignancy, also, develops much more commonly than in pseudomucinous cystadenomata; in the latter, when papillae develop they are scanty low nodules on the inner surface; when they are malignant, large portions of the tumor are solid or opaque. (Ewing).

Ewing describes genuine solid carcinoma as alveolar or medullary in structure, and very rarely, in elderly subjects, scirrhous. The former produce solid tumors, at first maintaining the form of the ovary but later becoming irregular. They are large and, on section, show an opaque uniform texture hooked up by lobulae and cysts, the latter being the result of necrosis and liquefaction, and not of dilatation of alveoli. Frank amplifies this description by calling the color reddish-yellow, and marked by red and brown area of hemorrhage. Necrotic parts have a bacon-like sheen. Scirrhous types of cancer are so hard as to resemble fibromata, the distinction often being impossible to make. Boldt reported a case with a similar appearing tumor, but the case Mills reported (which proved to be secondary) had a tumor, small and white and fibrous in appearance.

M. Rabinowitz has reported an adherent semisolid noncystic tumor that he has classified as adenomyoma but it and endotheliomata are too rare to merit much clinical consideration. The chocolate cysts that Sampson has so well brought to our attention are literally solid tumors—endometrial tissue in the ovary,—but are probably of clinical importance only as to their immediate care, and this is true of the much more common dermoid cysts which physically are so often solid.

The appearance of the connective tissue types of tumor might be considered a matter for easy distinction, but it must be closely observed. Ewing feels that a fibroma arises in a certain portion of the ovary, usually at the lateral pole, while a sarcoma is a diffuse process affecting the whole ovary. Fairbairn found in his five cases later that the ovarian tissue seemed to be distinct from the tumor but, on closer examination, it showed itself spread out on the tumor; the latter usually being dense white masses.

P. J. Reel on sectioning his specimen, refers to the interlacing bands and whorls of fibrous tissue, similar to those seen in uterine fibromata. A number of reporters also refer to these, which seems to me to be of great diagnostic value, and yet Hoon in his series of 55 from the Mayo Clinic, does not refer to them.

Let us refer again to Bland-Sutton who lays great stress on the existence of a capsule. He makes it an almost certain distinction between benign and malignant growths. To quote: "In their most typic forms, ovarian fibroids present easily recognizable characters. They are ovoid and of regular contour, quite smooth, intensely hard, and, as a rule, free from adhesions and unilateral. I have seen both ovaries affected in this way in one instance only. One pole of the tumor is connected

with the ovarian ligament and if the tumor has been bisected in such a way as to include this ligament, a small portion of the normal ovary will usually be detected associated with the ligament. * * * * A little attention to this relation of tumor, remnant of ovary, and ovarian ligament is of much importance, as it affords an extremely simple means of recognition. When the tumor is bisected, the cut surface displays the peculiar whorled disposition which is so distinctive of the hard uterine fibroid, and it agrees with that species of tumor, not only in its microscopic character but also in being encapsuled."

Of sarcoma, Frank's description is the most full; most of them are hard if of the fibrosarcomatous type—softer as the connective tissue elements decrease. Round cell sarcomata are soft, and resemble brain tissue; spindle cell tumors are white and firm. The surface is smooth and slightly nodular, the color is reddish, white and yellow. The shape of the ovary is often retained and the hilus may be retracted like that of the kidney, and adhesions are frequent. On section, hemorrhagic necrotic (dry yellowish) or liquid areas produce a marbled surface; lymphatic dilatation appears as small smooth cavities. Ewing does not greatly disagree with this except that the cystic spaces are more irregular in size and form than in cystadenoma.

According to Ewing, papillary serous cystadenomata are bilateral in 60 per cent of the cases, while pseudomucinous, the least likely to be malignant, are much more so.

He seems to contradict himself when he says that solid carcinomata are usually at first unilateral, metastases and recurrences of the other side are very frequent, and at another place he says that the majority of these tumors are originally bilateral or soon become so.

While he has published a most complete pathology, he makes no reference to the bilaterality of connective tissue tumors. Hoon and other observers feel that they are bilateral in about 2 per cent of cases, but as for sarcomata, Graves feels that 25 per cent are found on both sides. Bertino, investigating 468 cases of ovarian neoplasm in relation to bilaterality among the clinics in Florence, Italy, found 64 bilateral, of which 23 were benign and 41 were malignant. Of 79 mailgnant cases, 38 were unilateral. This material is fairly large but gives no decisive data.

The most serious question with which a surgeon must concern himself, is malignancy. When, for instance, is a papillomatous cyst, carcinomatous? In many, if not in most instances, the average clinician is not able to determine and indeed even the histogenesis is unknown, and admittedly so by such writers as Williamson and Barris in Eden and Lockyer's *System of Gynaecology*. While MacCallum, the pathologist, feels that many of the papillomata are not histologically malignant, I feel that we, as clinicans, must look more pessimistically, especially on the serous cystadenomata.

While Adami and Nichols wrote considerably earlier than MacCallum, they cannot be controverted when they say, "From the cystadenoma there is a natural transition to the carcinoma, for the epithelial benign tumors of the ovary, especially the cystic forms, are particularly liable to undergo malignant metamorphosis."

Ewing is more pessimistic, as he feels that any cystadenoma after papillomata appear, may degenerate into carcinomata, though he recognizes the greater liability in those of serous origin. He also informs us that carcinoma may develop in a *fibroma*, either from the downward growth of surface epithelium or from the proliferation of glands in a fibroadenoma. Brooke Anspach, as a clinician, feels that only by histologic examination can early malignant changes in papillomatous tumors be detected.

Treatment of solid tumors must take two courses. If we have an assured benign tumor, removal of it alone will suffice. If the tumor is malignant *or even suspicious*, I feel that complete pelvic extirpation should be done. I take this stand in the face of statements from Boldt* and from Vineburg who, before this Society in November, 1913, each reported a case of carcinoma of the ovary, and in neither event was there recurrence, one after six years, and the other, nine years, the latter patient bearing a child after the operation.

One of the greatest authorities, Oskar Frankl, believes that with primary cancer, if the ovarian capsule is intact, there need be no fear of implantation tumor—the uterus need not be removed. On the conservative side, we also find LeRoy Broun and Howard Taylor; the latter, in discussing Brodhead's case of sarcoma, felt that a woman anxious to have a child would prefer the risk and not lose the ovary. J. Whitridge Williams, in reviewing Frank's Gynecological and Obstetrical Pathology, puts himself on record as against removal of the other ovary in a case of unilateral papilloma.

W. W. Chipman, in discussing a case report of the writer's, in March, 1923, also aligns himself on the conservative side, even though the patient died a year after the operation for a tumor of the second ovary, the first being reported benign and the second "beginning malignancy."

There are many who will support the radical stand in a clear-cut unilateral malignancy, but when we consider observer after observer who warns us of the frequency of malignancy in ovarian tumors, and that the diagnosis of innocence or malignancy is most difficult, and frequently impossible, without the most carefully prepared microscopic sections, why are we not justified in being radical with the suspicious cases? Robert Frank, William P. Graves, Brooke Anspach,

*Dr. Boldt now informs me that the patient has since died of carcinoma of the other ovary.

and L. W. Strong would seem to consider that radical surgery would be truly conservative.

If on the other hand, we save a life at times, what have we lost to balance? Some needless sacrifice of ovaries with what is called "unsexing." Most tumors occur after 25 years of age and many if not the majority, occur after 35 years. If no children have come to the woman of the latter age, there is little likelihood of any occurring. In the younger woman, the risk of death or childlessness must be shared by the patient.

Brooke Anspach feels that "the effect of castration is no more serious in women after thirty than the normal menopause. In women before marriage, it interferes with the development of a *libido sexualis*. In women who have been married for some time and in whom the *libido* is matured, there is usually no diminution of sexual feeling. Indeed the removal of diseased and painful ovaries may make coitus more agreeable or at least, less objectionable." Anspach quotes Graves as taking this same stand.

As to methods of operating upon any ovarian tumor, there is one thing that should be axiomatic; it must be removed *in toto*, if physically possible, with no tapping or morcellation. The question of postoperative use of the x-ray or radium must be dependent upon the histology and gross pathology found at operation.

To summarize.—A survey of the literature informs us that solid ovarian tumors are difficult to classify, and to diagnosticate as to malignancy present or future. Treatment may be conservative or radical; in the former event, with grave risk from recurrence, and in the latter event, with the minor risk of sterility and "unsexing."

46 GATES AVENUE.

(*For discussion, see page* 621.)

ECLAMPSIA—IS IT A BIOLOGICAL NECESSITY?*

By O. M. Gruhzit, M.S., M.D., Detroit, Mich.

IN a search for the cause of eclampsia and the explanation of the symptoms and signs of the disease, I am not creating new hypotheses or facts. No doubt exists in the mind of anyone that what has been said about the symptomatology and pathology of eclampsia is true. This paper aims to account for, and to give an explanation of, the concurrent phenomena associated with eclampsia and thus to lead to the answer regarding the etiology of the disease.

Recently,[1] I advanced an idea that the eclamptic status is due to the interagglutination of the baby's red cell elements by the mother's serum. Since this publication, McQuarrie[2] has presented additional data which confirm my contention. Dienst[3] in 1905 advanced a similar conclusion, but later in 1908[4] retracted this idea and substituted another for it.

Castle[7] defines heredity as "organic resemblance based on descent." "The son resembles the father because he is a chip of the old block." The mendelian law implies that the individual is made up of unit characters which are transmissible to the progeny. Von Dungern and Herschfeld[8] demonstrated the presence of different unit characters specific to each blood group, and that these characters never occur in the progeny if not present in one of the parents, and that the blood group peculiarities remain permanent through the life of the individual. Recently, Ottenberg[9] has diagrammatically presented the possible transmission of the group characters from parents to offspring.

Landsteiner[10] in 1901 postulated the presence of different agglutinating substances specific to each blood group. Deseatello and Sturli[11] in 1902, and Hektoen[12] in 1907 proved by the absorption method the presence of two cell agglutinogens and two corresponding serum agglutinins. Jansky[13] in 1907, definitely recognized four types of blood. This was confirmed by Moss[14] in 1910.

In their embryologic development the red cells acquire agglutinogens first which are usually present at birth.[11] The complete blood group type is completely established inside of two years.[5] Recently Jones[15] claims that blood groups are completely established at birth. In summary, we may say that the heredity determines the blood groups. The essential property which differentiates groups is an

*Read at the Thirty-sixth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Philadelphia, Pa., September 19-21, 1923.

interagglutinating power between certain types. Upon this latter property, practice of blood transfusion has been based.

The hereditary transmission of blood group characters from parents to offspring has its limitations. The union of pure types of the same group results in a pure type of the same group. The union of hybrids of the same group results in a blood type according to the Mendelian law of segregation.

If a union occurs between two different pure line groups the offspring is a hybrid with dominating blood group characters of one parent, or with a different blood group in which characters of both parents are present.

In this presentation we are not interested in all the possibilities of group transmissions as presented by Ottenberg,[9] Jerrell[36] and Dyke and Budge.[37] What we want is to know those instances in which the baby's blood type is compatible with its mother's. This may occur only in limited blood group union of parents as shown in Table I.

TABLE I

INCIDENCE OF COMPATABILITY BETWEEN MATERNAL AND FETAL BLOOD GROUPS

The mother's and baby's blood groups are compatible if									
The mother is group				I	and husband is group				I
"	"	"	"	II	"	"	"	"	I or II
"	"	"	"	III	"	"	"	"	I or III
"	"	"	"	IV	"	"	"	"	I, II, III or IV.

Clashing cannot take place if the parents have the above blood grouping.

Our knowledge of interagglutinability of certain blood groups leads one to question what occurs in instances in which the mother's group is incompatible with her husband's and her baby's group; and whether such incompatibility is not responsible for some of the conditions in pregnancy, especially such obscure diseases as eclampsia, pernicious vomiting, some ideopathic sterility[37] cases as well as some miscarriages.

Halban,[16] Happ,[5] and Martin[17] have noted that the mother's serum may agglutinate in some instances the baby's red cells. Dienst[3] says that eclampsia is a result of incompatible blood transfusion. Shawasse[18] states that there is no relation between eclampsia and fetal or maternal "threat." This latter statement contradicts a theoretical conception based upon experience with blood transfusion.

If the union occurs between groups II and III with the resulting offspring of group IV, the serum of either of group II or III agglutinates *in vitro* cells of IV. We presume that similar agglutination could take place *in vivo*. Is there a possibility for the baby's cells to pass into the mother's blood stream? This we do not know, but if we do not challenge the long accepted theory[19] that waste products of fetal metabolism pass into the mother's system for disposition, we must

admit that such may be the case. Or, we may admit that Dienst and Young and Miller[20] were right when they assumed that a hemorrhage occurs in the placenta and that through this hemorrhagic area (according to Dienst and McQuarrie) the fetal cells may be poured into the mother's system. The latter statements are purely speculative and can be doubted if we study the history of the onset of eclampsia, especially the preeclamptic cases, where for several weeks we note a gradual progress of the disease. All symptoms gradually advance. With a hole in the placenta, symptoms would occur almost instantaneously.

However it may happen, it is not the purpose of this paper to explain how the elements carrying agglutinating powers pass into the mother's blood stream, whether as the "hypothetical agglutinogen" with a protein molecule or as red cells. The fact remains that to produce the symptoms of eclampsia by the interagglutination the baby's agglutinating substance must be present in the mother's blood stream. This would always occur, as shown in Table II.

TABLE II

INCIDENCE OF INCOMPATIBILITY BETWEEN MATERNAL AND FETAL BLOOD GROUPS

If the mother's type is	I	and husband's type is	II, III or IV, or
" " "	"	" " "	II	"	"	" "	III or IV, or
" " "	"	" " "	III	"	"	" "	II or IV, or
" " "	"	" " "	IV	she can never have incompatability of blood with any of the groups.			

Interagglutination can never occur if the parents have compatible blood group, as presented in Table I. On the contrary, interagglutination is always possible if the union occurs between parents of incompatible blood group, as presented in Table II.

This remains true in unions of pure types. If the union occurs between pure and hybrid, or between two hybrids, the blood type of the offspring is according to the Mendelian law of segregation and the interagglutination will occur according to the law of chance in segregation. The type of the female's blood, however, plays a great part in the occurrence of interagglutination. Thus, if the female is type I and the male is hybrid II, the resulting offspring may be either type I or II. If the offspring is type I there will be no possibility of interagglutination whether female is type I or II. If, however, the offspring is type II, there will occur interagglutination in 50 per cent of offsprings.

On the contrary, if the male has type I blood and the female is type II with the offspring's type of blood I or II, in no case could the female develop interagglutination, because from the experience on blood transfusion, we know that type II serum does not clash with type I cells.

According to the isoagglutination theory based upon the principle of the Mendelian law of segregation, interagglutination is possible in multiparae upon as many occasions as there occur incompatible segregation of blood types in mother as compared with her offspring. Thus, for instance, according to Ottenberg, if one parent hybrid of type II with one recessive character and other parent of type IV with two recessive character units, of which one recessive is like that of the other parents, their offspring may be 33.2 per cent IV, 33.2 per cent II, 16.6 per cent III, or 16.6 per cent I. In this case if the female is type II there may occur interagglutination with either type IV or type III child, but not with type II or type I child.

The eclamptic syndrome manifests itself with certain clinical phenomena and laboratory findings. The rise in blood pressure occurs first. The headaches, albuminuria and edema follow in the footsteps of increased blood pressure. The blood becomes "thicker," the urea content remains low, while the uric acid content is high. The total nonprotein nitrogen content remains almost undisturbed. The alkali reserve is decreased considerably. The carbon dioxide is manifestly increased.[21, 22] On necropsy, coagulation thrombi and focal necrosis are found in liver, lungs and kidneys.

There is extreme congestion, stasis and edema in all organs.

Zweifel[23] and Stronganow[24] have called attention to the increased blood viscosity in eclampsia as compared with normal pregnancies; however, no explanation has been forthcoming as to the cause for such an increase.

Determann,[25] Austrian,[26] and Burton Opitz[38] have shown that the viscosity of blood is maintained by the corpuscles and dissolved proteins. Salts, carbon dioxide and lacking of corpuscles increase viscosity greatly.

In normal pregnant women the blood volume is increased by about 15 per cent of the total volume[27] and consequently the viscosity of the blood of pregnant women is considerably below that of nonpregnant. The average viscosity of nonpregnant women is given by Austrian as 4.5, as compared with distilled water, which is taken as one.

During the last month of pregnancy the viscosity is about 3.4. In these cases of true eclampsia the blood viscosity was 4.5, 5.0 and 5.5. The blood chemistry does not lend evidence to the assumption that the increased viscosity is due to the retention of the salts or the waste products of metabolism.

The increase in viscosity can be experimentally reproduced in the test tube. If normal human serum is mixed with the incompatible red cells, as shown in Table III, the mixture acquires far greater viscosity than the same serum mixed with the same proportions of compatible red cells.

TABLE III

VISCOSITY OF COMPATIBLE AND INCOMPATIBLE SERUM-CELL MIXTURES

COMPATIBLE SERUM IV AND CELLS IV		INCOMPATIBLE SERUM I AND R.C. IV	
SERUM R. CELLS		WHOLE R.C.	HEMOLYSED R.C.
0.5 c.c. × 0.1 c.c.	2.3	2.40	2.80
" " 0.2 c.c.	3.0	3.80	4.15
" " 0.3 c.c.	3.25	4.70	5.30
" " 0.4 c.c.	4.00	5.30	5.65
" " 0.5 c.c.	4.40	6.50	6.60

The viscosity is further increased if the cells have been previously hemolysed by freezing.

Bailey,[28] Erlanger and White[29] and Kruse,[30] have shown experimentally that the introduction of colloid substances into the blood stream, as acacia or gelatin, elevates the blood pressure and the blood volume and may lead, according to Kruse, to the suppression of urine.

From the data presented, one is justified in assuming that the increased blood viscosity in eclampsia is due to a new colloidal state produced by the interagglutination between the mother's and her baby's blood.

The increased blood viscosity added to the increased blood volume irritates the capillary walls. This undoubtedly is an explanation for the occurrence of spasticity in the capillaries in eclampsia.[32] With the rise of blood pressure extra work is placed upon the heart, as it takes more force to pump a larger amount of thick blood against a higher resistance. However, these are not the only predisposing causes found in cases of eclampsia. A number of other factors come into play simultaneously. The blood chemistry[21, 22] shows an increased carbon dioxide content which indicates that the gaseous exchange between lungs and blood stream is slowed. There is a considerable lowering of the alkali reserve which means that oxidation processes of the body are lowered.

The low urea and slightly increased total nonprotein nitrogen content indicates that the hydrolysis of the proteins is interfered with. Baer[33] and Cornell[34] have conclusively shown that the basal metabolism in pregnant women is considerably increased above normal, being about plus 35 per cent. In few cases of eclampsia in which the latter could overcome the difficulties of recording basal metabolism, it is indicated that it is considerably lower than in normal pregnancies, and that it is lower before delivery in eclampsia and may increase after delivery, while in normal pregnancy it is higher before and gradually becomes normal.

Thus, it is more than suggestive that both oxidation and hydrolytic processes are seriously interfered with. This will appear more evident if it is remembered that throughout the body of the eclamptic

there is extreme congestion, edema, and stasis in addition to the coagulation thrombi and focal necrosis in all organs.

In summary, the pathologic changes in eclampsia can be explained satisfactorily on the basis of the new colloidal condition in the mother's blood stream which is produced by the interagglutination between the maternal and fetal blood. This results in a "thick" blood which calls forth an increase in blood pressure, spasticity of capillaries, general edema and stasis. In its turn, the body is not able to hydrolyse quickly enough the end-products of agglutination. The oxidation processes are slowed and the end-result is lowered metabolism, increased acidosis and the accumulation of carbon dioxide in the blood stream.

EXPERIMENTAL AND CLINICAL FINDINGS

In normal pregnancies the mother's blood type was determined before or inside of twelve days postpartum. The baby's type was determined at birth or inside of two days after birth. A drop of blood was suspended in about one cubic cm. of normal physiologic saline. The cells were typed against known types II and III sera by the cover glass drop method of Brem.[35] The reading was done immediately and repeated several times for a period of at least two hours. Typing was done at room temperature. The known sera II and III were always checked up against cells of type IV before their use. On the following day, the supernatant saline-serum mixture was poured off and substituted by fresh saline and the typing repeated. In abnormal cases the blood typing was invariably followed by ascertaining the effect of the mother's serum upon the baby's red cells and the baby's serum upon the mother's cells.

It is noted from Table IV that out of 86 cases diagnosed by the clinician as normal pregnancies, there were three cases in which the mother's serum agglutinated her baby's cells. Upon the examination of the hospital record, in one of these cases, the laboratory report

TABLE IV

BLOOD GROUPING IN NORMAL PREGNANCIES

NUMBER OF CASES	MOTHER'S GROUP	CHILD'S GROUP	
38	I	I	normal
18	II	II	"
4	III	III	"
4	IV	IV	"
11	II	I	"
1	II	III	"
2	III	I	"
1	IV	I	"
5	IV	II	"
1	IV	III	"
2	I	II	"

TABLE V

BLOOD GROUPING IN ABNORMAL PREGNANCIES

CASE	MOTHER'S GROUP	CHILD'S GROUP	COMPLICATIONS
1	I	I	Hydramnion. Placenta previa. No convulsions. Para. H.B.P.* Alb.+
2	II	II	Hydramnion. Contracted pelvis. Cesarean section. No convulsions. H.B.P. Alb.+
3	I	I	Postpartum convulsions. H.B.P. Alb.+
4	I	I	Nephritis. Albuminuria. H.B.P. The same with other 4 pregnancies. One slight convulsion with last pregnancy.
5	II	II	Nephritis. Secondary anemia. Cardiac hypertrophy. Alb.+ Same with other pregnancies.
6	I	I	Nephritis, edema. H.B.P. Alb.+ No convulsions.
7	II	II	Far advanced pulmonary tuberculosis.
8	III	–	Myocarditis. B.P. 80/58. Alb.+ Premature. Fetus dead. Blood Viscosity 2.95.
9	II	–	Nephritis, no convulsions. H.B.P. Alb.+ Viscosity 3.4.
10	III	III	Postpartum convulsions. B.P. 140/96. Alb. trace. Viscosity 3.3. Polyuria.
11	III	III	Postpartum convulsions two days following delivery. Polyuria for three months. H.B.P. Alb.+
12	II	I	Postpartum convulsions. H.B.P. Alb.+ Viscosity 3.2.
13	II	II – II	Nephritis. Cardiac failure. Twin pregnancy. H.B.P. Alb.+
14	I	I	Convulsions H.B.P. Trace of albumin. Polyuria.
15	IV	IV	Nephritis. H.B.P. No convulsions. Alb.+
16	II	IV	Eclampsia. Antepartum Convulsions. Cesarean section. Primary Alb.+
17	I	II	Preeclampsia. No convulsions. Alb.+ H.B.P.
18	I	II	Preeclampsia. Postpartum "blue and black, gasped for breath." Pulse went up to 160. No convulsions.
19	I	III	H.B.P. with each pregnancy. Alb.+ No convulsions.
20	III	IV	Eclampsia. Antepartum convulsions. Alb.+ Viscosity 4.5.
21	I	II	Eclampsia.
22	I	II	"
23	II	III	"
24	III	II	"
25	II	III	"
26	II	III	"
27	II	IV	Husband IV. Eclampsia, postpartum 21 convulsions Alb.+ Primipara.
28	II	III	Eclampsia. One antepartum convulsion H.B.P. Alb.+
29	I		Husband IV. Eclampsia. H.B.P. Alb.+ One convulsion intrapartum.
30	II		Husband III. Pernicious vomiting. Aborted at 3 months.
31	I	III	B.P. 220/110. Alb.+ No Convulsion. Viscosity 5.5 Preeclampsia.

*H. B. P.=High Blood Pressure.

showed albumin in the urine, which disappeared four days following delivery. This would indicate that this case was an undiagnosed preeclamptic and properly should have been classed under abnormal pregnancies. In two other apparently normal cases the blood grouping was incompatible. No laboratory record was available in these two cases. In the remaining 83 normal pregnancies selected at random, the blood grouping between the mother and her child was such that it could not produce interaggiutination.

If we study the blood grouping in abnormal pregnancies as shown in Table V, it will be noted that in hydramnia and nephritis without convulsions, the blood grouping between mother and her child is compatible, though in all of these cases the blood pressure was high and albumin was present in the urine.

There is a group of cases which clinically resemble eclampsia and, for the most part, are diagnosed as eclampsia, but have compatible blood type and the blood viscosity is low. The true eclampsia is understood to have high viscosity of blood. In three cases of eclampsia examined, the viscosity was high, 4.5, 5.0 and 5.5 respectively, while in the normal pregnancies the viscosity was on the average of about 3.4. This would indicate that toxemias of pregnancy fall into two groups; namely, the nephritic toxemia in which blood groups between mother and child are compatible and the blood viscosity is low; and the eclamptic toxemia or more properly isoagglutination toxemia which occurs when the maternal and fetal blood groups are incompatible and the viscosity is above normal for pregnant women.

TABLE VI

VISCOSITY OF BLOOD IN NORMAL AND ABNORMAL PREGNANCIES

8583	Normal	P–2	B. P. – 130/92	Alb.	– neg.	3.1
8625	"	P–1	" – 118/75	"	"	3.6
8629	"	P–2	" – 120/75	"	"	3.4
8667	"	P–4	" – 110/70	"	"	3.3
8679	"	P–2	" – 130/80	"	"	3.4
8085	Nephritis without convulsions. H.B.P. Alb. +					3.4
Kils	Nephritis with postpartum convulsions H.B.P. Alb.+					3.3
7911	Myocarditis, secondary anemia. Low B.P. Alb.+					3.3
8326	Chronic nephritis with retention and cardiac decompensation.					2.90
8361	Nephritis with postpartum convulsions H.B.P. and polyuria.					3.2
Edw.	Chronic nephritis. H. P. B. Alb. +					2.8
8060	Eclampsia, isoagglutination toxemia.					4.5
11651	Preeclampsia, isoagglutination toxemia.					5.0
8594	Convulsions, H. B. P., polyuria; Alb. trace					3.1
8658	Preeclampsia. B.P. 220/110, Alb. +. No convlsions.					5.5

We note from Table VI that normal pregnancy is associated with low viscosity. The complications of pregnancy, as nephritis, hydramnion and cardiac diseases tend to fluctuate around the normal pregnancy viscosity of blood. Secondary anemia tends to lower the

viscosity of blood below the normal average for pregnant women, which is in agreement with the findings by Austrian.[26]

It is evident from the experimental data that in normal pregnancies compatibility of maternal and fetal groups is a rule. An incompatability may occur without severe symptoms, but such occurrences are rare and far between.

In nephritis blood grouping has no relation to the disease.

In true eclampsia the interagglutination between maternal and fetal blood groups occurs as a rule.

Blood viscosity in isoagglutination toxemia is high as compared with normal pregnancies.

Blood viscosity in nephritis with or without convulsions remains the same as in normal pregnant cases. The variations which occur due to the other complications still further tend to lower the viscosity of the blood.

Blood viscosity may aid in the differentiation of isoagglutination toxemias from nephritic toxemias.

DISCUSSION

I have attempted to present briefly the theoretical foundation and practical experience of others leading to the formation of new ideas concerning the etiology of eclampsia as based upon the transmission of hereditary factors which invariably lead to the isoagglutination phenomena. It was shown that the incompatability between two blood groups upon clashing produce in the test tube a new, more viscous fluid. It is assumed that a similar condition would occur *in vivo* upon the passage of agglutinogen from the fetus to the mother's blood stream. The viscous colloidal state of blood can account for all symptoms, signs and pathology of eclampsia. The end-result of these changes produce stasis, congestion and decreased rate of metabolism, protein as well as carbohydrate.

Experimental data on the blood typing from normal and abnormal pregnancies further tend to substantiate that the interagglutination may be at fault in true eclampsia, but not in nephritic toxemias or normal pregnancies.

There is a group of toxemias which have low blood viscosity, compatible blood grouping and approximately the same blood findings as in true eclampsia. These cases may show no suppression of urine, in fact some may have considerable polyuria before and after delivery. The casts and small or large amount of albumin may or may not be present before the onset of convulsions. After the onset of convulsions, albumin and casts in urine increase considerably with each successive convulsion. Clinically these cases are difficult to differentiate from the true eclampsia unless one ascertains the viscosity and the

blood type between the mother and child or her husband. These cases probably belong to the type of "nephritic toxemia."

In fifteen clinically diagnosed cases of eclampsia or preeclampsia, the blood grouping in mother and her child was incompatible. In five cases of pregnancy toxemia with convulsions, blood grouping of the mother and her child was compatible. In eighty-three cases of normal pregnancies blood grouping was compatible.

SUMMARY

The laws of heredity determine the blood group of the offspring.

The incidence of incompatability between maternal and fetal blood groups is limited and may occur only in limited blood group unions of parents.

In normal pregnancies examined the blood grouping was such as to exclude the possibility of interagglutination between the maternal and fetal blood.

In the majority of clinically diagnosed cases of eclampsia the maternal and fetal blood grouping was incompatible.

High blood viscosity was found in eclampsia with incompatible maternal and fetal blood.

Low viscosity and compatible maternal and fetal blood was found in the "nephritic type of toxemias."

The high viscosity of blood in isoagglutination toxemias probably is due to the passage of incompatible blood elements from the fetus into the mother's blood stream.

The new colloidal condition of blood in eclampsia produces congestion, stasis and edema which are followed by lowered body function in general and especially of basal metabolism. As a sequence to the lowered metabolism hydrolysis of proteins and oxidation processes of carbohydrates compounds are slowed. This leads to the appearance of acidosis. The thick blood and spasticity of the capillaries lead to high blood pressure, stasis, edema, acidosis and convulsions.

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(*For discussion, see page* 620.)

TWO CASES OF RECURRENT CYST ADENOMA OF OVARY*

By David Hadden, M.D., F.A.C.S., Oakland, Cal.

IN reviewing the literature on the subject of papillary cystadenomas of the ovary I find few references to cases in which a recurrence has followed operation.

It is generally recognized that the condition is frequently bilateral, and may develop in the second ovary notwithstanding the fact that at the primary operation that ovary seemed normal, and that a complete removal of ovaries and uterus is advisable.

Another fact that stands out, rather negatively than otherwise, is the uncertainty as to whether or not the papillary masses when exposed to contact with the peritoneum, will develop independently of the ovarian structure. The advice given is, in every case possible, to remove the cyst without rupture or even puncture for reducing the size of the mass, as the danger of such transplant is great. Yet the literature does not seem to bear out such a liability in the majority of cases and the reported cases place those that do transplant in the group of cysts of a carcinomatous nature.

There is a rather marked absence in the literature of case reports where a second operation has followed for a recurrence, what condition was found and the final outcome.

A brief description of two cases may be of interest and value.

In 1917, Mrs. A., aged fifty-seven, was referred to me by an internist. She had a tremendously distended abdomen and the abnormal contents were crowding down on the uterus, bladder and rectum, interfering seriously with function.

In the spring of the same year she had a gall bladder operation by one of our best surgeons, at which time no pelvic disturbance presented. She returned to him a few months later with an enlarged abdomen caused by an ovarian cyst. The cyst was unruptured and was removed without disturbing its contents. Recovery was uneventful. Within the next three months the abdomen gradually increased in size until in December, when I saw her, the pressure was practically unbearable.

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*Read at the Thirty-sixth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Philadelphia, Pa., September 19-21, 1923.

Believing that I was dealing with a recurrence of the papillary growths probably arising as a general peritoneal involvement, and realizing that the fluid material was probably gelatinous and could not be removed by tapping, I opened the abdomen.

The whole abdominal cavity was filled with an enormous amount of thick gelatinous masses that had to be scooped out by hand. When sufficient of this material was removed, the tumor itself presented the appearance of a mass of fibrous tissue spreading throughout the abdominal cavity, but all the strands having their origin in the pelvis, and this connective tissue closely enmeshed with the jelly.

The tumor had recurred on the side from which the ovary had been removed, had burrowed its way between the layers of the broad ligament and practically replaced the uterine structure. The left ovary was not involved. I removed the mass from the pelvis as completely as possible going well beyond its limits on the peritoneum. The anterior surface of the rectum was the only peritoneal structure involved that I was unable to remove. The pelvis presented on completion of the operation all the vessels and the ureters exposed without peritoneum covering. A loose gauze pack was placed to keep the intestines away from the raw surfaces, the ends protruding through the vagina. This gauze was removed some days later and a radium application was made to the surface of bowel through the vagina. The abdominal wound closed without drainage, healed by first intention. The patient has been and is now, in splendid physical condition. In this case there was no evidence whatever of any papillary transplants on the general peritoneum.

The second case came into my hands last December. The woman was forty-three years of age and the mother of one child. She gave a history of an operation thirteen years before for a growth in the abdominal wall.

In April of 1922, she was operated upon in New Mexico for a cyst of the right ovary. The husband reports that at that time the abdomen was found filled with gelatinous masses and that the tumor arose from the right ovary. The surgeon gave him no hope for complete recovery, as he expected the papillary masses would recur from the general peritoneum.

This patient was comparatively well for six months when the abdomen began to enlarge rapidly and she complained of severe pain in the left upper abdomen. For six weeks prior to consulting me, she had submitted to the new fangled treatment originated in our adjoining city and now attracting so much general attention. Her husband realized that her condition had grown progressively more serious during these weeks and finally persuaded her to consult me.

Operation the next day showed the tremendously distended abdomen filled with thick gelatinous material. The filiform projections of the tumor, almost like a mass of seaweed, were running all through the cavity but with no attachments to the general peritoneum. The left ovary was the site of the growth. The uterus was normal and the right broad ligament not involved.

Complete hysterectomy with drainage through the vagina comprised the operation. The condition of the patient making her a bad operative risk, the complete removal of the gelatinous masses was made impossible. However, over five gallons was scooped out. For some weeks these masses continued to work their way through the vagina.

An application of radium was made in the vault about a week after operation. Some four weeks later a vesicovaginal fistula developed. I do not feel that the radium can be blamed in this case, but rather that the general breaking down of the tissue due to the decomposing masses of gelatinous material which were being extruded from time to time was the cause, some of these masses being as large as a fetal head.

Last May I repaired the fistula and obtained primary closure. The tissues of the vagina and vault presented at that time a perfectly healthy appearance.

I feel that these cases are interesting mainly from the standpoint of showing no peritoneal transplants, and also that operative procedures are to be considered as by no means hopeless.

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ABDOMINAL HEMORRHAGE FROM RUPTURED GRAAFIAN FOLLICLE CYST*

BY DAVID HADDEN, M.D., F.A.C.S., OAKLAND, CAL.

THAT abdominal hemorrhage from a rupture of a cyst of the ovary or a graafian follicle is comparatively rare, is emphasized by Emil Novak, in a paper from the Gynecological Department of the Johns Hopkins University in 1917. In that article he records only forty reported cases, including his own, up to that year. In order to add the following case to the records as well as to emphasize the similarity of such a pathology to an acute appendix, I am presenting this history.

Miss C. U., aged twenty-eight, a Russian, in good general health prior to the attack, complained of severe acute abdominal pain with vomiting. For four days prior to the attack she was badly constipated and the evening before, was given an enema by her mother. Shortly afterward she was seized with acute abdominal pain, vomiting followed and persisted until morning, when I first saw her.

Physical examination showed a tender and rigid right side with the signs most marked in the region over the cecum. The left abdomen was flaccid with no tenderness. The temperature was 100 with a pulse rate of 87; the white cell count 10,500 with 78 per cent polynuclears.

Pelvic examination showed a normal uterus and no indication of ovarian complications.

A right-sided gridiron incision was made and upon opening the peritoneum the abdomen was found full of bright blood. Realizing that the appendix was not the site of the hemorrhage I made an investigation of the pelvis. The right ovary was healthy but the left, found in proper position, was bleeding very freely from a ruptured graafian follicle cyst about a half inch in diameter.

The appendix presented some indication of a chronic inflammation but not of sufficient severity to account for the right-sided rigidity and tenderness. The bleeding of the ovary was controlled and the appendix removed. Recovery was uneventful.

Questioning the patient more fully after operation in order, if possible, to determine the cause of the injury since the time of the attack was postmenstrual, I found that the tip used in giving the enema was the vaginal type of black rubber of large caliber, and that the patient experienced considerable pain on the left side upon its insertion.

The rate of bleeding from the ruptured follicle was of such degree that in time the patient would certainly have presented symptoms of abdominal hemorrhage, but the primary symptoms were those of a beginning acute appendix.

OAKLAND BANK OF SAVINGS BUILDING.

*Read at the Thirty-sixth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Philadelphia, Pa., September 19-21, 1923.

REPORT OF THE COMMITTEE ON MATERNAL WELFARE TO THE AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS AND ABDOMINAL SURGEONS, 1923*

IN 1921, at the St. Louis meeting of our Association, a resolution was offered for the appointment of a Committee on Maternal Welfare, and in 1922, at Albany, the first report of the Committee was presented, formulating the general scope of the work to be accomplished. This included a comprehensive scheme of propaganda to be carried on in conjunction with a similar committee of the American Gynecological Society, under the chairmanship of Dr. Fred L. Adair, of Minneapolis, who has long been enthusiastic to improve obstetric conditions. His efforts, together with those of the late lamented Dr. Sedgwick, have given to Minneapolis a conspicuous place in regard to improved statistics in both maternal and infant welfare.

Our report for 1922 was printed in the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY, for June, 1923.

A conference of the Committee, consisting of Dr. Henry Schwarz, of Washington University, St. Louis; Dr. George W. Kosmak, Editor of the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY, New York, and the Chairman, concluded that the report for this year should consist of a questionnaire survey of the work already done in various centers of population, both urban and rural, in prenatal care, in improved technic and in follow-up work. In this way, we shall determine if any substantial improvement can be appreciated in statistics of maternal morbidity and mortality.

It was further suggested that next year the Committee, in joint action with that of the American Gynecological Society, take up the question of uniform nomenclature in obstetrics; also a discussion of the proposition, which is now being agitated in several states, as to the advisability of the movement to substitute graduate nurses for midwives to attend cases of confinement, in such communities as are not provided with physicians.

An undertaking so vast in its possibilities, as this inquiry into maternal welfare, is appreciated as a most difficult and delicate one. The opportunity to improve conditions must be grasped as a constructive and helpful program, and not as destructive criticism. The aim of the Committee is to lay before the Association the assembled facts, in a purely impersonal and instructive manner.

The remedy of conditions must be applied according to the value of these facts, and their adaptibility by the individual physician to his community.

To this end the records of work, the experience and the opinions of obstetricians, health authorities and welfare workers were sought. Five hundred letters, in addition to those sent to our own fellows, were mailed to Boards of Health of states and cities, to welfare organizations, to medical journals, and to individuals supposedly interested in maternal welfare. A comparatively small number of replies was received.

Those who have been willing and able to assist the Committee have our grateful thanks, and to them we make acknowledgment. To the others, the hope is expressed that they will join future committees in the endeavor to extend the work of publicity, which is so essential in this field.

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Insofar as possible, throughout the report, all deaths from puerperal causes are classified under the International List of Causes of Death (Second Revision, 1909). All puerperal causes comprise the causes of death classified under International List Titles, 134 to 141 inclusive, and puerperal septicemia comprises the cause of death under the List Title 137. Other puerperal causes comprise those classified under Titles 134 to 141, excluding puerperal septicemia. However, since the great majority of statistics in this country are based on the rate per 1,000 live births, a part of the figures quoted are on that ratio, instead of the 10,000 ratio.

Many of the statistics herewith quoted are from the tables and charts furnished by Dr. Anna E. Rude, of the Children's Bureau, Department of Labor, and the Committee expresses its appreciation of her repeated courtesies.

In order to have an intelligent method of comparison of the relative position of our states and cities, the records of Birmingham, England, are taken as a standard. Due to long and active efforts at prevention, Birmingham has the lowest rate of morbidity and mortality of any large city in the world. That city, according to the Bulletin, Department of Health, New York City, May 1921, during the years 1915 to 1921 shows a death rate from puerperal causes averaging 31.94 per 10,000. These figures should be kept in mind.

One of the first publicly analyzed experiments in prenatal care was begun in Boston, in 1909, with the House Cases of the Boston Lying-In Hospital, and continued during the five years before that institution opened its own prenatal clinic.

In that year there were carried to the onset of labor 1,512 patients without a death, and in the first year only two miscarriages; in the first half of the second year one miscarriage, and never another. The rate of stillbirths was about half of that of the city at large. The rate of premature births was reduced to 0.7 of 1 per cent, and the neonatal deaths were from one-half to one-third of the death rate of the city at large.

Dr. Franklin S. Newell sends the figures covering the prenatal work of the same clinic for another five years' period, 1917 to 1921 inclusive, and also the figures for another of the larger maternity hospitals in Boston for the same period. These are in regard to eclampsia, and show the value of prenatal care.

	BOSTON LYING-IN	MASSACHUSETTS HOMEOPATHIC
Total number of confinements	11,180	9,579
Number of cases of eclampsia	43	48
Number of cases developing eclampsia who received care in hospital clinic	7	13
Number of deaths from eclampsia	11	19

Of the 11 who died in the Lying-In, only one had received prenatal care; and of the 19 who died in the Homeopathic clinic, only two had received prenatal care.

The City of Boston has had a high maternal mortality rate. In 1921 one mother died in every 130 births. This is the third highest rate in the 15 largest cities in the United States, being exceeded only by New Orleans and Cincinnati, as stated by Dr. Julius Levy in the American Journal of Health, February, 1923.

The maternal death rate in Boston has been continuously decreasing during the last five years, except in 1918.

The report of the Instructive Nurse Association shows that prenatal care lowered the infant mortality 60 per cent and the stillbirth rate 44.5 per cent in the cases that came under their observation, in comparison with those that did not have such care.

Dr. Charles A. Pratt, New Bedford, Massachusetts, reports from a smaller center, showing the universal result of prenatal care, that in the New Bedford Hospital, 1922, there were 534 births with only one case of puerperal sepsis, which recovered; one death from placenta previa and two from cesarean section. In St. Luke's Hospital, with the private obstetric patients of 80 men who constitute the associate staff, no sepsis occurred in 1922. Dr. Pratt says: "Since the advent of rubber gloves, I do not again expect to see a temperature go above 100."

Dr. G. H. Noyes, Providence, Rhode Island, reports that Rhode Island, as a State, is conducting no program of maternal welfare work; that the City of Providence is doing nothing directly to educate its women regarding the importance of prenatal and skilled obstetric care.

Providence, in 1922, recorded 6,617 births, with only 34 maternal deaths, 0.5 of 1 per cent; stillbirths, 3.7 per cent; of the deliveries 19 per cent were conducted by midwives, with 10 stillbirths and 4 cases of sepsis. No death rate is given.

Bristol, Rhode Island, reported 178 births in the first half of 1923, of which 37 per cent were conducted by midwives, or had no attendant. In this group there were no maternal deaths and 3 stillbirths.

The State of New York, 1915 to 1921 inclusive, shows a death rate from all puerperal causes averaging 54.9. In New York City the rate was 46.1. Puerperal septicemia mortality in New York City, for the same period, was 30 per cent of the total mortality. Maternal mortality from all causes varies but little in New York State; while there was an increase in 1918, due doubtless to the prevalence of influenza, the average for the five years was 14.4.

In puerperal sepsis in 1919 New York City showed the world's low record of 11.4 per 10,000; in this being conspicuously under Birmingham with 15.9 per 10,000.

In 1922 the new Division of Maternity, Infancy and Child Hygiene, established by the Legislature of New York State, began its activities. We are favored with a copy of the recent letter of transmittal by Dr. Otto R. Eichel, Director, to the late Dr. Hermann Biggs, Health Commissioner of the State, under whose auspices the Division was developed. The report includes an analysis of the five years, 1916 to 1920 inclusive, and comprises the record of 1,191,130 live births and 50,552 stillbirths, of which 680,130 live and 31,352 stillbirths occurred in New York City. Maternal and infant mortality include statistics based on live births and stillbirths combined, and must be taken as the ratio of death from all puerperal causes, per 10,000.

New York City occupies a position which is unique in regard to maternal and infant welfare. By its elaborate system of development of Health Centers, under the Department of Health, results commensurate with the outlay of endeavor and money are at once apparent.

The Clearing House of the Maternity Centers of the City is one of the economic factors in keeping the work organized, and the records uniform. It affords an agency of dissemination of information under a single control. This feature has doubtless aided the constituent members of the organization to simplify their work. Up to December, 1919, it was found that 21,014 cases had been cleared, and that 3,210 of these had been reported by two different bodies. In other words, duplication has now been prevented.

The Clearing House offers its services to the population at large, both to those who can afford to pay and to those that cannot following the same methods of reducing maternal and infant mortality that the leading obstetricians observe among their private patients. It was not organized primarily to collect statistics proving the value of prenatal care, but to carry on an experiment in preventive

medicine, differing from hospital administration, in that the cases are not actually handled through the pregnancy and puerperium. Maternal mortality of 40 per 10,000 is evinced as an argument as to the results obtained, being about 10 better than the city rate.

Interesting results are reported from Brooklyn. In a "Study of 2,000 Cases," 1922, the Prenatal Supervisor of the Visiting Nurse Association of that city, finds that among the 1,002 babies whose mothers had received prenatal care, there were 22 neonatal deaths and 25 stillbirths. Among the 1,001 cases that had no prenatal care, the number rose to 41 neonatal deaths and 35 stillbirths. Here prenatal care saved over one-half the babies, as compared with Brooklyn's mortality in general.

The report of Dr. Alfred C. Beck, of Brooklyn, in a paper, "End Results of Prenatal Care," gives a table of comparisons of three series of 1,000 cases each, with the following results:

Series 1. No prenatal care—stillbirths 35; infant deaths 41; total 76.
Series 2. Visiting nurse, but no physician—stillbirths 25; infant deaths 22; total 47.
Series 3. Prenatal care throughout, under medical supervision—stillbirths 19; infant deaths 6; total 25.

In other words, in the last series 1.9 per cent of cases ended in stillbirths and 0.6 per cent died under 14 days, a total of 2.5 per cent. These records are from the Long Island Hospital Clinic. They were under the control of Dr. Beck and Dr. Polak, with a corps of the Visiting Nurse Association, who made home visits.

From the Department of Health, Connecticut, Dr. A. E. Ingraham writes, (August 14, 1923) that the organization of maternal and infant welfare will be completed and a report made next year. The Children's Bureau, Connecticut, gives a mortality of 68 per 10,000 in 1921.

Michigan reports for 1922 a maternal mortality of 67 per 10,000, and infant mortality of 74.7 per 10,000, as compared with 63 maternal and 79 infant mortality in 1921.

Detroit reports, through the epidemiologist of the Detroit Department of Health, that, "It is humanly possible to cut down the deaths in early infancy. The results of our prenatal work in Detroit indicate what it is possible to accomplish. Catering to people in the less well-to-do sections of the city, and among whom unfavorable complications were only too frequent, it was possible to keep the infant mortality rate during 1919 and 1920 down to 78. (The infant mortality rate in the city of Detroit, as a whole, was 96.7 in 1919, and 104 in 1920, while it dropped to 83 in 1921.) By extending the privilege of physical examination and advice to the prospective mother, it is felt that many unnecessary deaths of babies during the first month of existence may be avoided."

Michigan has only begun to be organized under the Sheppard-Towner Act.

A graphic chart of Milwaukee's report for 1922, compiled for the Committee, by the courtesy of Dr. Thompson, Secretary of the Health Department, at the request of Dr. Henry C. Davis, Secretary of the Obstetrical Section of the American Medical Association, shows that while Milwaukee's increase in population in ten years was 100,000, the birth rate in 1922 was the lowest since 1910; that while the percentage of cases delivered by physicians increased from 39 to 84 per cent, and those delivered by midwives decreased from 39 to 13 per cent, and that while hospital deliveries increased from 2 to 25 per cent, there was no lessening in the maternal death rate in the period 1912 to 1922. Maternal mortality averaged for the ten years 39.8, being 39 in 1912 and 39 in 1922.

In a recent experiment in Minneapolis, covering 20 months, in a section of the city "where the midwife had previously held full authority," a group of women

were supervised during pregnancy by the Infant Welfare Society and its attending physicians. "Out of 1,545 births in the northeast section during that period, 32 died in the first two weeks; but out of 157 prenatal cases cared for in the clinic none died in the first two weeks. The stillbirths in the group attended were 50 per cent less than were reported in the city at large."

An advance information manuscript chart, prepared by the Councilor of the 10th District of Maternal and Child Hygiene of Ohio, Dr. Sylvester J. Goodman, Columbus, and received through his courtesy, gives the statistics relative to maternal mortality, from all causes, in the 48 cities of Ohio having a population of 10,000 or over. The figures on the 5 largest cities follow:

	PUERPERAL SEPSIS			ECLAMPSIA			ACCIDENTS OF LABOR			CESAREAN SECTION		
	1920	1921	1922	1920	1921	1922	1920	1921	1922	1920	1921	1922
Cleveland	34	65	28	25	24	24	25	21	15	14		5
Cincinnati	36	24	13	14	11	10	9	5	10		3	
Toledo	22	28	11	7	11	9	11	5	9		2	3
Columbus	16	16	12	9	10	5	13	2	6		3	5
Dayton	10	12	9		5	5	13	2	6			3
Total for State	279	259	111	106	107	105	127	67	78	36	8	25

A gratifying decrease in puerperal septicemia will be noted, while no improvement in toxemia nor the accidents of labor are recorded.

Dr. A. J. Skeel, one of our Fellows in Cleveland, is in charge of a large welfare district in Ohio, and gives a vivid report of its activities. Then branches of the University Medical School Dispensary, in cooperation with the Public Health Bureau, have been set to work in prenatal care and follow-up work.

This is in conjunction with the extension organization of the state, through the Advisory Committee of the State Department of Health. This committee appointed by the Director of Health, includes a prominent obstetrician for each of the large cities, Cleveland, Cincinnati, Toledo, Columbus and Dayton; also representatives of the Graduate Nurse Association, the Public Health Society, the Ohio Hospital Association and other organizations interested in public health.

A conference, held May 11, 1923, under the State Director of Health, Dr. John E. Monger, at Columbus, laid plans for the operation of the Sheppard-Towner Act in Ohio. It was definitely stated that the intention of the Public Health officials was to carry out the provisions of the law, in such manner, that the personal relation of the practitioner and his patient should be preserved, and in no wise disturbed.

A series of demonstrations are being held under the auspices of the Bureau of Child Hygiene, of the State Department of Health, cooperating with local health authorities, in communities where desired, and special consideration is given to hygiene of maternity and infancy. These demonstrations are to be continued for sufficient time to determine their efficacy, and then it will be decided if they be made a permanent work. Before actual proceedings were begun, it was considered advisable to call conferences of County Medical and County Dental Societies, to present the object and scope of the proposed demonstration; to make a preliminary survey of each community as to its local problems and facilities; to arrange for central office space for cooperative assistance from professional and social groups; to arrange for meetings at various times, of public officials and volunteer organizations, in order to adopt plans for permanent work.

Indiana shows a dearth of maternal welfare work, since the prenatal program has been but recently laid out.

From Ft. Wayne, Dr. L. P. Draper, Department of Health, reports that maternal mortality fell from 87 in 1920 to 63 in 1923.

Dr. A. M. Mendenhall, Indianapolis, writes that the adoption of the Sheppard-Towner Act by the Legislature, in 1923, will be followed by an administration that will be under the Division of Infant Hygiene, of the Public Health Department. The $50,000 available in the state is to be spent in education.

The Illinois Department of Public Health reports through its Director, Dr. Isaac D. Rawlings, who, writing July 30, 1923, says that while $19,000 was received by the Department in June, 1922, as a three months' payment on the contemplated work of the state under the Sheppard-Towner Act, that the Attorney General ruled that the money could not be accepted, except by the action of the Legislature. The Legislature refused to authorize the acceptance, so that it has been impossible to undertake maternal and infant welfare work in the state under the Act during the present biennium.

In a service comprising 40,000 cases in the Chicago Lying-In Hospital, there has been no death from eclampsia of any woman who attended the prenatal clinic, and Dr. DeLee writes the Committee that very few patients developed eclampsia.

A survey of welfare conditions in Chicago was published by the Chicago Community Trust in 1922, showing some improvement in prenatal statistics, which will doubtless be further developed.

Chicago has organized the Infant Welfare Society with 28 stations. This Society by its 1923 report shows that 99,491 visits were made by its nurses in 1922. It spent $116,000 in welfare work.

A reduction in maternal mortality from 70 to 63, from the years 1920 to 1922 is recorded for the city.

The State of Missouri is not in the Birth Registration Area, and the efforts to improve conditions have been sporadic. In spite of the object lessons of clinics and welfare agencies in lessening morbidity and mortality, little change in statistics is to be noted. The cities are developing some organized efforts and these show a more hopeful outlook.

In St. Louis, an investigation as to the effect of prenatal care, supervised by Barnes Hospital of Washington University, was made under the auspices of Dr. Henry Schwarz and his associates. Of the 334 women applying for free medical attention to be given them during the periods of pregnancy and confinement, 46 received dispensary care only; the other 288 were visited in their homes. Most of the women registered between the fifth and eighth months of pregnancy. a few came to the dispensary as early as the second month. They were instructed in personal and home hygiene, and routine methods were used. The results showed the value of prenatal care. The neonatal rate for the clinic was 3.17 per 1,000 live births. In the City of St. Louis, as a whole the rate was 3.8. The rate of stillbirths was 20 per cent greater in the city than in the clinic.

From a report on Maternal Risk Rate in Kansas City, compiled by Dr. Ralph Wilson, June, 1923, it appears that the total maternal deaths from all puerperal causes in 1922, as given by the Vital Statistics Bureau of the Board of Health, was 73 per 10,000. This is exceeded by Boston having 77, with this remarkable coincidence that these two cities, which have the lowest percentages of births attended by midwives, 2.5 in Boston and 1.6 in Kansas City, are among the four cities with the highest rate of deaths from puerperal sepsis.

At Christian Church Hospital, where all the patients, except emergencies, were under prenatal care through pregnancy, the results of three years' service, as compiled by Dr. C. A. Ritter, were as follows: all puerperal mortality 2.6 per 1,000; no deaths from sepsis; stillbirths at term, all causes, 3.6 per cent; an incidence of cesarean section 2.7, no deaths; premature births, 1.4 per cent. This

record shows a reduction over the annual report of Kansas City in general of 65 per cent maternal mortality, and 40 per cent infant mortality.

Two prenatal clinics, that of the Junior League, now in its third year, and that of the Out-Patient Department of the Kansas City General Hospital, both under the supervision of the Chairman of this Committee, give these results: No maternal mortality is shown in the records of the Junior League, and an infant mortality of 3.1 per cent, the General Hospital's records give a maternal mortality of 4.2 and infant death rate of 59.5, with 11.9 per cent of stillbirths.

It is to be noted that since 1918, the puerperal mortality in the limits of Kansas City has been reduced 40 per cent and the infant mortality 25 per cent.

The report of the maternity service at Stanford University, San Francisco, under Dr. Alfred Baker Spalding, Chief of the Division of Obstetrics and Gynecology, received August 1923, gives a comparison of the results of their supervised clinic with those of the city at large. The city shows 7.4 in 1919, 9.3 in 1920, 6.1 in 1921, of maternal mortality in 1,000 live births; the clinic shows an average for the three years of 4.8; the infant mortality was reduced in the same period from 63 to 47 in the city at large, with only 32 as an average for the clinic.

Dr. Frank C. Ainley, Obstetrician to the Hospital of the Good Samaritan in Los Angeles, reports, August 1923, that from January 1921 to July 1923, there were delivered in this hospital 1,177 patients with a mortality of 4 mothers, 22 stillborn infants and 17 neonatal deaths. He adds that the patients are almost entirely private, and have had some prenatal care under their own obstetricians. These figures include all cases of placenta previa, toxemia, lues, premature deliveries and congenital deformities.

Dr. Ainley, in the same hospital, in less than three years' period, had 578 deliveries with no maternal mortality. His records show 9 stillborn infants and 9 infants died before leaving the hospital.

From Oklahoma comes a report, compiled by Dr. W. A. Fowler, Oklahoma City, in which that new state shows a maternal mortality of 61 per 1,000 births, from all puerperal causes; a stillbirth rate of 5 per cent and a fetal death rate of 93.

In the clinical service of the Oklahoma State University, extending over a period of ten years, there has been no maternal death from eclampsia and only one death from sepsis. Both epidemics of influenza were passed through with no abortion nor maternal deaths among supervised cases.

Fourteen of the States, including Alabama, Delaware, Kentucky, Florida, Michigan, Mississippi, New Jersey, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Utah and Virginia, have decided to include as a part of their program for maternal welfare in the near future, the licensing, supervising and instructing of midwives.

The marvelous achievement of the last decade in maternal welfare is that of the pioneers of better obstetrics in the South, in the men like Dr. Plecker of Virginia, Dr. Leathers of Mississippi, and of Dr. Welch of Alabama, among the negro midwives; and of Dr. Rawlings of Texas among the Mexican midwives.

Through the efforts of Dr. Junius A. Rawlings, in 1920, El Paso, Texas, undertook an unusual piece of maternal welfare work. The population of that city is 40 per cent Mexican, and 65 per cent of the Mexican women are delivered by midwives. Supervision of midwives was instituted by a reorganized City Health Department, now under the direction of Major R. E. Tarbett, of the United States Public Health Service; this included literacy test, physical examination, and instruction in the usage of protective obstetrical methods. The requirement of the report of births to the Health Department is so rigid, that it is estimated that 99 per cent of the births attended are reported.

The city employs a supervising nurse and a corps of nurses to visit the homes in a follow-up work in connection with a prenatal clinic.

From Mississippi, the biennial report, dated June 30, 1923, has been received in advance, by courtesy of the Secretary of the State Board of Health, Dr. Leathers. It deals with the striking problem of the enormous proportion of births attended by negro midwives, and the difficulty of dealing with ignorant, illiterate and superstitious women. However, as the Commissioner states the facts: "There are not enough physicians in Mississippi to attend the maternity cases which develop, and because of the peculiar economic and living conditions the midwife is a necessity." A State Supervisor visited 71 counties in 1921 and investigated 154 white and 2,955 negro midwives. Permits to practice were refused to 55 negro and 6 white midwives. Lectures, demonstrations and conferences with public health officers were held at 110 different points.

The Board reports that 438 mothers died in Mississippi in 1912. Of the births in 1922, it is recorded that 22,741 were attended by physicians, and 22,703 by midwives; 600 had no attendant. Stillbirths numbering 4,670 were reported, which is suggested as one of the reasons that Mississippi has decreased in population, in the last decade. The report stresses the economic value to the state of the loss of these lives of mothers, and the potential citizenship thus lost to the state through the waste of infant lives.

Dr. W. A. Plecker, State Registrar of Vital Statistics, reports that the Commonwealth of Virginia shows some little reduction in septic deaths.

Since 1918 the Legislature has placed under Dr. Plecker's supervision the 6,000 or more midwives who are permitted to practice in the State of Virginia. They are taught elementary rules of midwifery, which are printed in a booklet, "Helps for Midwives." A few simple rules are also printed on the back of their Practice Permit. Obedience to Rule 3, which forbids them to make inside examinations, is most strenuously emphasized.

Two booklets are sent to all newly married women whose marriages are reported to the Bureau, "The New Family" and "Feeding the New Family."

The chief part of the maternal and infant welfare work is now under the supervision of Dr. Mary Brydon, who has the dispensing of the Sheppard-Towner fund. This Department is working especially on the education of midwives and parents, in connection with the State Bureau of Vital Statistics, and following the lines laid down by Dr. Plecker.

A brief resumé of the present status of the Sheppard-Towner Act is herewith abstracted. Forty-two states have accepted the provisions of the Act; and forty-one are now developing a program of education in maternal and infant welfare.

The first money available under the appropriation was portioned among the states in April, 1922. Owing to some delay in decisions in the office of the Comptroller, the payments were generally made in June and July, 1922.

According to the report of Miss Grace Abbott, published in the American Journal of Health, September 1922, the Act intends that the plan of organization shall originate in the state, and shall be adapted to local needs, with the purpose:

1. To secure an appreciation among women of what constitutes good prenatal and obstetric care.
2. To make available the community resources, so that women may have this type of care.

The proposed program is based on a supposed knowledge of what skill is available in different parts of each state, and to what extent that skill is being utilized by the women of the state.

In many states the general lack of facilities is said to require that the Direc-

tor must, without the resources which the good city clinic offers, endeavor to create a system to fit the situation, working in virgin soil.

The Federal funds available for the states under the Act are:

1.—$5,000, with no cooperation on the part of the State.

2.—$5,000 to match each $5,000 put up by the State.

A deficiency Act passed by Congress, March, 1922, made available $490,000 for the remainder of the year, and for the year ending June 30, 1923, an additional appropriation of $1,240,000 was voted by Congress.

The states that have not availed themselves of the funds are Maine, Massachusetts, Rhode Island, New York, Louisiana, and Washington. Twelve of the acceptances are by State Legislatures, and thirty by Governors, pending the regular session of the Legislature.

Of the 41 states which accepted payments for 1922, 21 matched their full allotment; 5 matched in part and 11 accepted the $5,000 without matching.

No uniform action seems to have been taken regarding the expenditure of the money. Some states are trying to correlate the fund to the sections of the state where the largest maternal and infant death rate prevails. Eighteen of the states accepting the Act are not yet in the birth registration area, and maternal and infant mortality records are not complete.

Their plans of work, then have no definite, unified basis of procedure at present. One state, with $62,000 available, has selected two counties as training and demonstration centers, divided into: (1) City Problems; (2) Small Town Problems; (3) Rural Problems; (4) Mining Camp Problems.

Another state, spending $176,967, provides for two field physicians, six supervising nurses, four full time nurses and eighty nurses giving half time to maternity and infant field work.

In another state, with $10,000 of Federal funds unmatched, general education from a central office will be given, and two demonstrations, one in town and one in the country, of the work of a prenatal center, will be put on during the year.

One small eastern state has $76,808 and plans to reduce maternal mortality by:

1. Instruction of mothers.
2. Investigation of the deaths of mothers attended by midwives.
3. Supervision of midwives.
4. Cooperation with hospitals.

Forty-four nurses will visit the new born and do follow-up work.

Other states make their program more fully educational, employing school nurses during the summer months, for infant welfare work. These are usually those with unmatched Federal funds.

Sufficient data, relative to maternal welfare work through varying agencies, have been presented to demonstrate that prenatal care and hospitalization have invariably reduced the rate of maternal morbidity and mortality, wherever intelligently and persistently carried out.

Maternal welfare has become popular, through the activity of women's organizations, which carried on the propaganda that resulted in the Sheppard-Towner Act, and brought Federal aid to the states.

The enormous funds now available, and being utilized for educational work, along the lines already planned, must greatly augment the influence of the Bureau, and help to realize its purpose, defined in no uncertain terms: "To secure among women an appreciation of what constitutes good prenatal and obstetric care."

Dr. G. W. Kosmak, a member of this Committee, who took part in a symposium on maternal welfare, the report of which is published in the August, 1923, issue of the New York State Journal of Medicine, discusses the prenatal care of

women without hospital facilities. The conclusion of the paper, which, of necessity covers the problem of the great majority of all maternity cases, since only a comparatively small number of women can, with our present capacity of hospital beds and the high cost of hospitalization, be sent to a hospital, is as follows: "Women will never escape what must be designated as the accidents of pregnancy and labor, but they may be spared much of the danger, which is now accepted as being of preventable origin. It is this phase of preventive obstetrics in which organizations, self-constituted and enthusiastic to do welfare work, can find a proper field for their activities. This cannot be successfully accomplished, however, in any community without a lay interest being manifested by persons who will, by a generous philanthropy, provide the means of financial support; and, also, by an interest on the part of semiprofessional organizations, such as associates of trained nurses, as well as women's clubs; and finally by an interested medical profession, willing and ready to lend its aid. All such elements of the lay, the semiprofessional and the professional people, if they cooperate, can bring about an organization powerful for good; and also elastic enough to recognize the responsibility of each class and to accept by agreement that each shall function as an entity, neither invading the prerogative of the other, and thus to impress upon the community its value as a factor in upholding the public health."

Signed, HENRY SCHWARZ, M.D.
GEORGE W. KOSMAK, M.D.
GEORGE CLARK MOSHER, M.D., Chairman.

(*For discussion, see page* 615.)

ITEM

American Association of Obstetricians, Gynecologists and Abdominal Surgeons

The Thirty-Seventh Annual Meeting will be held September 18, 19, 20, 1924, at the Hotel Statler, Cleveland, Ohio. For any further information, address the Secretary of the Association, Dr. James E. Davis, 111 Josephine Avenue, Detroit, Mich.

Society Transactions

AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS AND ABDOMINAL SURGEONS

THIRTY-SIXTH ANNUAL MEETING

PHILADELPHIA PA., SEPTEMBER 19-21, 1923

(*Continued from April issue.*)

DRS. GEORGE W. CRILE, U. V. PORTMANN, AND T. E. JONES, Cleveland, Ohio, presented a **Symposium on the Relative Rôle of Surgery, X-Rays and Radium in the Treatment of Carcinoma of the Uterus.**
(For original articles see pages 528, 536, 541.)

DISCUSSION

DR. EDWARD A. WEISS, PITTSBURGH, PA.—Unfortunately, in the past we have heard surgeons declare that surgery should be the only treatment, and that radium has no place in the management of cancer, and then we have the positive statement of the radiologist who declares only in favor of the x-ray. We have very few surgical clinics where cancer cases have been considered as group studies. These perfectly honest and reliable statements of Dr. Crile and his associates make it clear that surgery has its decided limitations in the treatment of uterine cancer.

During my association with Dr. Werder we found many difficulties attending the radical operation, and for a long time that was the only method of treatment to which we resorted. Our results after several years showed decided shortcomings, and we felt that possibly radium would be of value, and we consequently combined radium with surgery but as Dr. Crile has said, we found the combination to be disappointing. We believe that in the last two or three years, where we have used radium alone, or radium with x-ray, our results are far better.

I would question the treatment of carcinoma of the fundus with radium and x-ray. I believe that surgery is still the method of procedure. In the treatment of these cases it makes a great difference what type of carcinoma we are dealing with, whether squamous-cell or adenocarcinoma. I firmly believe that regardless of what treatment we institute for adenocarcinoma of the canal, we have a very serious proposition and a condition that is practically impossible to cure.

I should like to emphasize the point that has been made that we should be fair and open-minded and we will be safe to follow the teaching of Dr. Crile, namely, we must recognize that surgery has decided limitations, that radium is a splendid adjunct, but from our present observations radium and x-ray promise the best results.

DR. EDWARD J. ILL, NEWARK, N. J.—This is a vital and intensely interesting subject. In 1884 I removed the uterus for carcinoma of the cervix for the first time, and just before the War, when we got the last journals from Europe, I saw that at Freiburg they were giving up operations for carcinoma of the cervix for the use of radium. I said to myself they are mistaken. But four years ago we

gave up the operation on the cervix for radium and since the ultimate results were so much better than from operation that from that time we have not operated on a single case of carcinoma of the cervix. My son, who is working in this line, tells me that 21 per cent of the cases where he has used radium have remained well over three years. In the past we have not operated on every case that presented itself, so we do not think it is fair to use radium on every case of carcinoma of the cervix, because of the hopelessness of the condition.

As to cancer of the body of the uterus, that is another question. I have not lost a single case of cancer of the body of the uterus from operation in twenty-five years, and there has not been a single recurrence in that length of time. Radium can do no better than that. On the other hand radium has been used in three cases that were not mine. In these three cases, the uterus was removed afterward, and in a great many sections not a single bit of tissue of a carcinomatous nature could be found. I think it is possible that as I grow older and do not like surgery as much as I used to, I may refuse to operate on cases of corpus carcinoma and have them radiated. At present I believe that corpus carcinoma should be operated on in preference to the use of radium.

DR. RUFUS B. HALL, CINCINNATI, OHIO.—I would not enter this discussion were it not for the fact that the remarks of Dr. Ill prompted me to do so. There is a certain percentage of cases in which I believe cancer of the body of the uterus should be operated on. Personally, not in twenty years have I had a single recurrence following operation for cancer of the body of the uterus. I have had many recurrences in cases of cancer of the cervix, and while I am not convinced that we still have the right treatment in radium and x-ray, I am willing for these men to try it out under Dr. Crile's supervision. That is the most desirable means of trying out radium and x-ray in association with a surgeon like Dr. Crile that has ever been presented to us, and I believe we will get some kind of answer we can rely on in cancer of the cervix. I have quite a number of cases that were operated on years and years ago that have yet remained well. I recall one case that I operated on more than twenty-five years ago, a woman, forty-five years of age, with far advanced carcinoma. I believed I had operated too late and that she would have a recurrence and die. I did a vaginal operation. The uterus pulled apart during the operation in three different pieces. Strange to say, that woman is alive today, and one or two other patients equally as bad are alive today also.

Within the last year and a half a woman came to me with cancer of the cervix and I said I would not operate, although the destruction of tissue was not larger than the rubber on a lead pencil. The case looked like an ideal one for radium. She was given radium and x-ray and was dead in four months.

DR. HERMAN E. HAYD, BUFFALO, N. Y.—Three years ago I sent a woman to the Cancer Hospital of Buffalo, who weighed 210 pounds. She had a large squamous-cell carcinoma of the cervix, as big as a small orange and certainly was an unfavorable subject for operation. She was bleeding profusely. Dr. Schreiner, who has charge of the cancer work in the Institute at Buffalo, gave her radium and deep x-ray applications. He showed that woman before the Buffalo Academy of Medicine a year afterward, with a number of similiar cases. There was absolutely no return whatsoever of the disease. I naturally became enthusiastic over the treatment of cancer of the cervix by radium, and yet within the last year I sent Dr. Schreiner two more cases. Dr. Schreiner said to me, "These are the kind of cases in which we get splendid results." But both of them are dead. There is the disappointment. Although we may be enthusiastic over such treatment today, we have to study these cases carefully as we may be disappointed tomorrow. So far as cancers occurring in the corpus,

never returning, after operation, in the main it is true, yet I removed a cancer of the body of the uterus thirteen years ago, and I saw the patient a few days ago with a return of the disease in the stump. I had taken the cervix out, made a clean dissection. I sent her to Dr. Schreiner for radium treatment. Notwithstanding the poor outlook in these cases, whether we use surgery or radium, we must look at the subject with an open mind, and Dr. Crile is doing the right thing. When we have 300 cases in which surgery has been resorted to, and then 300 cases with radium, or radium and x-ray, our statistics will be worth something.

DR. GEORGE W. CRILE, CLEVELAND, OHIO.—In the interest of the discussion I should like to add that we have not given up the surgical treatment of carcinoma of the fundus, but are for the present using x-ray and radium in the treatment of cervical carcinoma.

DR. HENRY SCHMITZ, CHICAGO, ILL.—For the evaluation of radiation therapy in uterine carcinomata we should group them into these groups: localized, borderline, clearly inoperable and terminal. In the last mentioned group we have lost seven patients as a result of severe intoxication produced by the application of radium and x-ray. We have given up radiation treatment in the terminal or advanced cases entirely with radium and x-ray for the reason that these cases are absolutely hopeless from any standpoint of treatment. In our clinic we have not operated on any case of carcinoma of the cervix for the last three years; radium and x-ray have given us better results and the patients have survived three- or four-year periods free of all subjective symptoms. Surgery should not be combined with radium and x-ray in clearly inoperable cases as the patient will do much better and live longer without operation.

In our statistics of 303 cases published a year ago, we had 14 per cent absolute five-year cures, taking all carcinomata into consideration at that time.

The type of carcinoma is of great importance for radiation treatment. Cervical carcinoma are composed either of spindle-shaped cells or cylindrical cells or squamous epithelial cells. They possess a different radiation sensitivity. The basal cell carcinoma will respond to a 100 per cent E.S.D. radium and x-ray dose; the cylindrical cell adenocarcinoma to about 150 per cent E.S.D., and the squamous epithelial cell cancer to about 175 per cent E.S.D.

DR. HERBERT W. HEWITT, DETROIT, MICH.—It is quite generally known that some cases of carcinoma are refractory to the x-ray and to radium. I understood Dr. Crile to say that he did not employ surgery in any case of carcinoma of the cervix. I wonder what he would do with those cases of carcinoma of the cervix which are refractory. I would also like to ask Dr. Crile what his experience has been in removing the uterus with the Wertheim operation or a modification of it?

DR. CHARLES L. BONIFIELD, CINCINNATI, OHIO.—I believe that Dr. Portmann in his estimation of 9 per cent of permanent cures is about right. Dr. Hall said he recalls a number of cases that lived twenty-five years, so do I. But the thing I particularly want to speak about is that we must not forget the work of those men who have gone before. The truth of the matter is that in cancer of the cervix, Byrne, of Brooklyn, Baker, of Boston, and Reamy of Cincinnati, secured just as good results from high amputation of the cervix with cautery as any of us have obtained. That brings me to the second point. I was rather surprised at the rapid recurrence of these cases. I have seen cases die that I thought would live, and other cases I thought I had cured have died since. But remembering the work of our predecessors, it has been my custom

for a number of years in every case of cancer of the cervix to thoroughly destroy all cancerous tissue that I could with the actual cautery. In that way I believe I have reduced the mortality considerably and prolonged the lives of many.

DR. JAMES E. KING, BUFFALO, N. Y.—For four years I have not done a radical operation for cancer of the cervix and for the past two years I have had a certain amount of radium in my possession. All who do surgery for malignant disease must have been impressed with one thing and that is, that the extent of malignancy does not necessarily determine whether or not an operation is to result in cure. Some of the most marked and worst appearing malignant conditions clinically, have much to our surprise resulted in a cure; whereas other cases apparently with slight involvement have gone rapidly on to death after operation. I have found that the same thing is substantially true in the use of radium. There is unquestionably a factor concerning which we know little that controls the destiny of these cancer cases. We may call it resistance or immunity but there is some biologic factor which determines whether or not operation or radium or any other form of treatment will be of permanent value. This, in my opinion, is the important question in connection with the cure of cancer. The question of radium dosage is entirely a secondary matter and I am sure in the future it will be relegated as a more or less unimportant detail of radium treatment. At this point, I am prompted to ask the essayists whether or not they have ever seen the slight improvement from x-ray or radium where there has been a recurrence of cancer in the broad ligament. Personally I never have, and I have had opportunity to follow these cases which have had the most approved methods of radiation.

DR. PORTMANN (closing on his part).—With regard to carcinoma of the fundus of the uterus, we are not using deep x-ray treatment, but there is no reason why we cannot get good results in treating carcinoma of the fundus as well as carcinoma of the cervix. There is, of course, the difference in the cell resistance. A hundred per cent dose may kill in one instance, and a 70 per cent dose in another.

In answer to the remarks of Dr. King, we have been disappointed in radiation or surgery because we do not know the biological reactions of the cells and have no means of doing so at this time. The different types of cells yield so differently. A certain type of cell will yield differently under similar circumstances.

As to Dr. Schmitz's cases of carcinoma in which he reports five-year cures, we have had four cases of terminal carcinoma in which we expect no results at all.

DR. JONES (closing on his part.)—With regard to deaths following radium treatment, I have had none because I have not treated type iv with attempt at cure. For their discharge and bleeding small doses of radium were given for palliation, but I can readily see that large doses of radium and x-ray would kill these type iv cases.

DR. CRILE (closing).—The mortality rate for my series of radical hysterectomies has been 7.4 of all that I have attempted to cure. The five-year survivals of all operations, palliative and radical, have been 16.3 per cent.

Regarding the technic, in cases of cancer of the cervix we always destroy all of the cancer that we can with the cautery the day before the hysterectomy if that is to be the only operation. We leave the alcohol pack in place over night and the next morning do an abdominal hysterectomy, carrying the dissection out into the broad ligaments. The reason for that is obvious. I did a group of Wertheim operations, but I do not do it any more because of the high mortality rate. In the cases in which I found carcinoma in the glands which I removed

also, the mortality was so high that I did not feel it was logical to continue that type of operation.

In cases of carcinoma of the fundus we have reversed the picture; we always operate on cases of carcinoma of the fundus through the vagina, first sterilizing the vagina for the purpose of killing any stray cancer cells which might be there. Also before operating we cauterize the cervix, pack it with alcohol gauze, and put on large clamps, thus firmly imbedding the gauze in the cervical canal. I never release these clamps until the uterus has been removed. Our great fear has been implantation of cancer cells. Our results have been so favorable as to convince us that we should continue in the same way.

Dr. King has certainly raised an important question. In our biophysics department we have under way a research which we hope will enable us to forecast the exact physical condition of the cancer in any place so that the proper dose can be prescribed.

DR. GEORGE C. MOSHER, Kansas City, Mo., presented a **Report of the Committee on Maternal Welfare.** (For original article see page 601.)

DISCUSSION

DR. G. W. KOSMAK, NEW YORK CITY.—I feel that this report should not be allowed to pass by without a word of commendation to Dr. Mosher for the excellent work he has done in connection with this committee. Although I am a member of the committee, it is entirely Dr. Mosher's work and we owe a great debt of gratitude to him for it.

I should like to draw the attention of the members to the beginning of this movement. Dr. Mosher has kindly given me credit for introducing it before the American Gynecological Society. It seemed to me several years ago things had come to such a pass that the organized medical profession of the country was being more or less slighted in this important work, and that lay interests had largely superseded our efforts in the direction of what should be considered purely a medical problem.

As I stated in my paper before our State society last spring, these lay organizations should take up certain parts of the problem and carry them out, but remember, gentlemen, this in most of its essential features is a medical problem, and it is only through the insistence of organizations national in their scope, such as this one, that the public at large will appreciate that fact and will give us the credit for much of the pioneer work and insist on our participation in it. For instance, funds appropriated by the state and federal governments should not be spent in the collection of useless statistics which have no bearing on the subject. I have lived through several activities of that kind in my own city, and I find that money has actually been wasted in the collection of information with little or no bearing on the subject, money that should have been expended for visiting nurses, for doctors, for hospitals, to care for these women. By insisting as physicians on the proper conduct of these investigations and the proper expenditure of these moneys, real scientific progress can be made. I do not want to decry the possible future good effects of the Sheppard-Towner bill. That bill as first drafted left the medical profession entirely out of consideration. There were so many changes made that the authors possibly did not recognize it at all when it came up for final passage. The bill was radically changed from the beginning to the end, and if it had gone through as first proposed the entire administration would have been in lay hands. Now, medical men have something to say.

The profession has been bombarded for the last ten or fifteen years by statements largely from lay sources, concerning the high morbidity and high mortality in pregnancy, due to the doctors in contrast with midwives. We should not put the midwife on a pedestal. There is probably some excuse for her, but there is no reason why we should continue to allow her to exist forever. In the course of the next fifty years we will find something that will displace her, but at present we have to put up with her. For the present she must be under the direction of medical men. In Pennsylvania Dr. Nicholson and his confreres are directing the midwives, with the result that they now have excellent statistics. Doctors have been blamed for the high death rate from sepsis. In New York City we have recently gone through an agitation of that kind. Let me call your attention to the fact that there is bound to be sepsis. It comes in waves. We get series of cases that resemble epidemics. Next year, without any great change in technic, these septic statistics disappear and there is no further cause for complaint, and when somebody simply says that doctors have more sepsis than midwives it is not necessarily true. You can make figures tell almost any story.

What shall we do in a practical way? There is no need of our Association blaming anybody for this state of affairs. Obstetric practice can, however, be improved, especially by the general practitioner who sees most of these women. He will not do it unless the economic factors are changed to pay him for so doing. The man in the country district, who has to travel miles to take an obstetric case for ten dollars, is not to blame if he cannot give proper attention to that case. It is up to us to propose something. Our committees on Maternal Welfare have been working for three years, and are now getting together material upon which to base recommendations that will in time, I hope, do some good. The Association can do something in a practical way; it can cooperate; it can show its readiness to associate its activities with any other organization that will agree to bring something forward of a practical character. It is a mistake to assume that the Sheppard-Towner bill will correct the situation. I do not believe it will. It will take more than that, and it will take community interest. The point I have tried to bring out repeatedly is that unless you develop community interest you will not get results. The fact that a state appropriates $100,000 to match the Federal government's $100,000, will not accomplish much. The final result must be accomplished by members of this and other Associations and by local obstetricians who will enter their respective communities and develop this sense for the necessity of better obstetrics. That will do more good than large appropriations of money which I am afraid will, as in the past, be devoted largely to the collection of statistics by nonmedical people and nurses who ought to be better occupied. Unless we exert our own influence, that state of affairs will continue. It is with a plea for greater community effort manifested through the members of national bodies such as this one that I want to close my remarks, and finally to commend again Dr. Mosher for the excellent work he has done in bringing this matter before your attention.

DR. JAMES E. DAVIS, DETROIT, MICH.—I want to commend the work of Dr. Mosher. This is a remarkable report. It represents a great deal of careful work, and any of you who have had the work of collecting statistics know how difficult this undertaking is.

I am hardly as sanguine as the last speaker. I do not feel quite comfortable when laymen come to me and tell me what I should do professionally, especially if I know the things they tell me to do are the things I ought to do. I think

I should have known these things before and have acted before they came with their suggestions.

I believe we are just about in the position stated by Dr. Kosmak, namely, we are not so much to blame as some of our critics have said we were, and yet there is something wrong, and I am quite sure that the statistics wherever these conditions exist can be greatly improved. I agree with the last speaker that a national body like this should deliver to the public information that should be considered authoritative, and we ought to be very careful in the collection of that material. I only wish we might have an endowment that will go beyond what we can give to this work from the funds of the Association. If we had an amount of money, say $5,000, I think part of it might be given to the expenses of collecting data and of making a statistical study, and when done by a committee such as we have we know that the data collected would be reliable. There would not be any bias in the report; it would be a scientific collection of facts from the best available sources. I believe there ought to be some clinical and laboratory research work done, as that would support the statistical report gathered. An appropriation might be administered so that in two or three different places we might have this clinical and laboratory research work carried on. At the end of the year all data would be assembled and could be issued in pamphlet form. This would constitute an authoritative statement.

DR. LIDA STEWART COGILL, PHILADELPHIA, PA. (by invitation).—I only emphasize what Dr. Kosmak has said. It has been said repeatedly that the public must demand better obstetrics, and I have always rather resented that remark. I feel that physicians should be the leading factors and directors in this work of creating the demand among the public for better obstetrics. It is rather humiliating to have lay organizations come to us and ask that we give this prenatal care. I feel that each physician should go out and organize this work in his own community and be responsible for the fact that it is possible for every woman in that community to receive prenatal care. There is a great deal of medical prenatal care that must be done. If we are going to have the dignity and high standard of obstetrics maintained, it will never be done by waiting for the public to demand better obstetrics from the physician. It must be the reverse. We have the cart before the horse when we have the laity demanding better obstetrics from us. How are we to know how much prenatal care and postnatal care is being done in our community? In Philadelphia, in one of the health organizations with which I am connected, we found in making a survey that there had been no effort made in this city to find the type and amount of prenatal care being given. We tried to find this out by sending an annual questionnaire to each organization doing so-called prenatal care work, asking just how much prenatal care was given to patients and what were the results; how many were taking routine blood pressures, making routine Wassermann examinations, and securing vaginal secretions for microscopical examinations. It was surprising to find how little of this information we could receive from institutions. At first, there was a feeling of resentment at our asking these questions, but when they found out what we were trying to secure, we received a few more replies. It was clearly pointed out that institutions must be provided with more social workers and physicians to enable us to get these statistics. I feel very keenly physicians must be the leaders in this cause. We all know it is the medical prenatal care we must ourselves direct, and when we have public meetings in health centers it is difficult at times to find a physician willing to speak. It is all in the hands of lay workers and this is a reflection upon us.

DR. OTTO H. SCHWARZ and DR. ROBERT CROSSEN, St. Louis, Mo., read a paper entitled **Endometrial Tissue in the Ovary.** (For original article see page 505.)

DISCUSSION

DR. JAMES E. DAVIS, DETROIT, MICH.—This presentation should call to our minds the logic used by Dr. Deaver yesterday, that in medicine we can frequently criticize one another for our limitations, but if we are to be thoroughly prepared our subject is of enormous size. This presentation this morning brings to our attention the work of the clinician who has gone into the laboratory to enlarge his knowledge of a clinical subject. We need just this kind of work all the time to amplify the exact knowledge of the clinician. In this presentation there is the correlation of pictures. This promises help, to understand from further work just how we are to recognize the gross pathology of these conditions when the abdomen is opened. It may be asked, is it of any consequence? If there is a menstrual reaction in the appendix it must have clinical significance. If this is in the ovary, it must be of clinical significance.

The outstanding things in connection with this work from the standpoint of the gross pathology, are the changes so far as we are able to recognize them from the work of Dr. Schwarz, which appear upon the surface of the ovary, and usually the appearance is that of a cyst or hematoma, or also perhaps in general terms a displaced tissue, a graft as it were.

Coming to the microscopic conditions, we could very logically argue the question as to what is the explanation. Dr. Schwarz has already covered that in saying that there is a possibility we have to deal with the germinal cells of lower inclusion. We are all familiar with that type of change. We may consider, as he has mentioned, the germinal follicle which goes on to luteal formation. All these have to be considered and for practical purposes are not so important as the study of the gross pathology, so that we can make clinical applications of this work. If this occurs in 10 per cent of our cases, surely we have a new pathology to be written concerning the ovary.

There is a great field for clinical research, and when we talk about the laboratorian and the clinician being apart, it is perfectly absurd to think of them as being separate individuals. The laboratory worker ought to be constantly enlarging his knowledge of clinical things; the clinician should be constantly going into the laboratory and ought to be able to read within a limited degree the microscopic pathology of the specimens he has removed.

DR. FRANCIS REDER, ST. LOUIS, MO.—Some years ago I presented a paper before this Association on "Premenstrual Appendicitis," by that I mean, an attack of appendicitis preceding the menstrual period by two or three days. Many physicians have diagnosed this condition as an ovarian pain, which it is not. The slides thrown upon the screen clearly demonstrate to me the correctness of my diagnosis in these cases. The endometrial tissue demonstrated microscopically in the appendix explains to me the attacks of appendicitis shortly before menstruation. With removal of the appendix the attacks of pain cease.

DR. JAMES E. SADLER, POUGHKEEPSIE, N. Y.—I want to emphasize what Dr. Davis has said. I presented to Dr. Sampson one of the four cases in which one of the locations of this lesion was in the appendix. It was due to our local pathologist (Dr. Carpenter), in association with the pathologist of the State Board of Health, that this pathologic condition was noted.

My case, not only had its original inception in the right ovary but the appendix microscopically showed a distinct lesion, and four inches from the ileocecal junction

there was a distinct obstruction, which showed the characteristic endometrial tissue described; therefore, the discussion made by Dr. Davis brings home to us emphatically the fact that there is no divorcing the clinician from the laboratory man, and that one is dependent upon the other.

DR. WM. S. BAINBRIDGE, N. Y. CITY.—The association clinically between a diseased right ovary and appendicitis and the likelihood of premenstrual appendicitis was pointed out by the late Dr. A. J. McCosh, who often called attention to the anatomic relationship of the blood vessel of the right ovary and the appendix.

DR. EDWARD J. ILL, NEWARK, N. J.—I want to ask, if this is endometrial tissue, why does not the cavity empty in the uterus?

DR. EDWARD A. WEISS, PITTSBURGH, PA.—This study of Dr. Schwarz makes me feel that we have been lax in our observation and study of this type of ovarian pathology. Studies like this bring out splendid clinical observation just as years ago, Cullen made a careful investigation of all fibromata in the Johns Hopkins clinic and found a surprisingly large number of adenomyomata that had been classified as fibromyoma.

The finding of endometrial tissue in the ovary in association with hematoma presents an interesting phase of clinical deductions and I gather that Dr. Schwarz does not consider hematoma as an endometrial reaction. May I ask the cause of the hematoma we so frequently find in young women? Is the bleeding a secondary affair?

DR. SCHWARZ.—The blood is associated with menstruation.

DR. WEISS.—The ovarian hematoma I have found to be of much clinical importance. Not infrequently they are of particular interest from a bacteriologic standpoint and have been found to be of particular virulence and should not be regarded as a simple hematoma or slight infection. I would like to ask Dr. Schwarz whether he has made observations on the bacteriologic findings of these ovarian hematomata.

DR. JAMES E. DAVIS, DETROIT, MICH.—I would like to ask Dr. Schwarz to speak of the analogy existing between this condition and aberentia of the mammary gland. The aberentia we find in the interstitial portion of the oviduct or horn of the uterus, the glands being carried out beyond the lumen. When you make a cross section of the horn of the uterus you will find gland formation.

DR. SCHWARZ (closing).—In the first place, I took up this study to confirm the microscopic findings of Sampson. Sampson in his very voluminous article which appeared in the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY in 1922, reports his cases in great detail. He goes over many case histories and points out distinctly the relation between the clinical and the pathologic sides. Therefore, I refer you to his article.

As to the question of Dr. Ill, these hematomas are frequently closed cavities and blood does not escape except when there is perforation. I wish to call his attention to the fact that the endometrial glands are of the serous type and one would not expect mucus in these cavities. Only the cervical glands secrete mucus.

As regards the question of Dr. Weiss, we have made no bacteriologic study, but we feel there is no connection with infection. For instance, in the case where the appendix was riddled with endometrial tissue, there was no evidence of any inflammatory reaction.

As to the glands which Dr. Davis referred to in the uterine horn, so-called cornual adenomyoma of the uterus may be derived in two ways. They may be derived, in the first place, from the proliferation of the lumen of the interstitial portion of the

tube, and in the second place, they may occur after a transplant has taken place at this point with secondary invasion of the wall. Previously, when the cause of adenomyoma of the uterus was so much discussed, there was one type which had a direct connection with endometrium, and the other type closely related to the serosa. There was frequently no stroma in the subserous type. I believe Sampson has suggested that this type may result from the implantation of tubal epithelium around which there is no accompanying stroma.

DR. O. M. GRUHZIT, Detroit, Mich., read a paper entitled **Eclampsia—Is It a Biological Necessity?** (For original article see page 588.)

DISCUSSION

DR. WM. S. BAINBRIDGE, NEW YORK CITY.—The essayist has brought us the result of some very painstaking laboratory and clinical work which, if the findings are verified by others, may prove of practical value not only in preventing eclampsia but in opening a door for promising research in other conditions. The determining of the coagulability of blood and the initiation of proper preoperative treatment have saved many patients from serious complications and even death from hemorrhage.

Some of us who have been particularly interested in cancer have been hoping that the study of the blood may help us explain why 33⅓ per cent of all mice who live two years or over develop malignant disease, and about five per cent of those so afflicted spontaneously recover from the disease. Some light may come through laboratory study of the body fluids, especially the blood.

Certainly the paper we have heard today, while startling because of its statements and needing confirmation, is enough to encourage further research along this line.

DR. EDWARD SPEIDEL, LOUISVILLE, KY.—I would like to ask some questions in regard to the incompatibility between the husband and wife. If the blood of the pregnant woman is incompatible with her husband, then at the end of pregnancy she bears an incompatible infant. It is supposed that during the pregnancy the excretions of the infant enter the mother's circulation, does that immunize her against the former incompatiblity existing between herself and her husband in future pregnancies? In the second place, when and how shall we examine the blood of the infant and type it with the mother in case of eclampsia, to prove or disprove the assertion the essayist has made?

DR. GRUHZIT (closing).—Dr. Speidel asked whether there are changes in the mother's blood at the end of her pregnancy if she has an incompatible baby. This phase of the subject has not been studied to any considerable extent. Among the cases of eclampsia, only in two cases had the serum lost the agglutinating power. This may be explained by assuming that fetal cell elements passed into the mother's blood stream in sufficient amount to bind the mother's agglutinins.

DR. DAVID HADDEN, Oakland, Calif., presented papers entitled **Two Cases of Recurrent Cyst Adenoma of Ovary** and **Abdominal Hemorrhage from Ruptured Graafian Follicle Cyst.** (For original articles, see pages 598, 600.)

NEW YORK OBSTETRICAL SOCIETY

MEETING OF DECEMBER 11, 1923

THE PRESIDENT, DR. FRANKLIN A. DORMAN, IN THE CHAIR

DR. JOHN O. POLAK showed and described several specimens of **Ovarian Fibroma, Sarcoma and Carcinoma,** illustrative of the evening's topic of discussion, **Solid Ovarian Tumors and Their Treatment.**

DRS. S. H. GEIST AND ELIOT BISHOP each presented a paper on this topic. (For original articles see pages 567, 576.)

DISCUSSION

DR. LAWRENCE W. STRONG.—In reading the subject as assigned, "Solid Ovarian Tumors and Their Treatment," I was a little in doubt as to what classes of tumors would be presented and considered. Of course, in using the word solid tumor of the ovary we do not get a very clear picture of what the real nature of the tumor may be. The word "solid" does not imply very much and I should much prefer to use the classification that Dr. Geist has already alluded to, namely, the stromatogenous and parenchymatous divisions. By parenchymatous, one means the essential physiologic products found in the ovary, and by stromatogenous one means the supporting tissues, and I think histologically one is always able to make out that distinction. As it, nevertheless, is plain that Dr. Bishop and Dr. Geist wanted to make the subject broader than that and wanted to include epithelial tumors as well as stromatogenous tumors, I think I should have entitled their paper "The Less Usual Tumors of the Ovary," meaning by that both epithelial and stromatogenous types because, plainly, the common tumors of the ovary are the ordinary cystic tumors with which we are all very familiar, and in those we do not find such great difficulty in making a decision as to their malignancy or their benignancy. When it comes to the solid epithelial tumors of the ovary I think one might say invariably they are malignant. A truly solid epithelial tumor of the ovary must surely be malignant, but that does not absolutely mean that the patient will die of a recurrence if it is removed, for occasionally it may happen that we are able to get ahead of the process, and even though it is undoubtedly a malignant tumor, complete ovariotomy will be successful in conserving the patient's life.

Solid epithelial tumors of the ovary are, for the most part, of the brain-like, encephaloid type, and undoubtedly are of rather high grade of malignancy, as Dr. Geist has already said. As to the more dense ones, I will confess I have never seen a primary scirrhous carcinoma of the ovary. Metastatic lesions from the stomach or the breast we meet with in the form of the Krukenberg tumors. The malignancy of the growth in this case is dependent upon the primary tumor, which is the important factor. I will now pass to the stromatogenous tumors.

Dr. Bishop did quote me as saying from my slight experience at the Woman's Hospital, that the fibroma are the most frequently found, and I still believe that. In looking over today the number of solid stromatogenous tumors of the ovary that we have met in the last ten or twelve years, I find we have had one true sarcoma and three true myomas. I did not total the number of fibromas we

have had in those years, but I am sure it must be over a hundred, and I have met with four in the last two and a half months. I feel that surely the fibroma is the only one that is commonly met with, and that one should seriously consider as the solid stromatogenous tumor of the ovary. There are varieties of that tumor. There is one which replaces the entire ovary, which is not so common, and there are also the forms which one gets on the surface of the ovary, the papillary forms. Those are commoner, and they have a particular interest because they are exactly analogous to the normal stroma of the ovary; in fact, there is no boundary line. The tumor at the periphery simply shades off into normal ovarian tissue which gives the hint as to their relative benignancy. One surely could not feel that a tumor of that sort would ever result in the destruction of the life of the individual.

The myomata, as far as my slight experience goes to show, must be rare because muscle tissue in the ovary is rare. It comes in largely from the muscular tissue of the ligament situated at the hilus. If there is a myoma, ever in the ovary, it is probably due to muscular tissue derived from the ligament musculature, the blood vessels and from the hilus.

As to the sarcomata, it is true enough, as Dr. Bishop has said, that one is not able to distinguish anything definite about a sarcoma cell which will always identify it from a very cellular fibroma. Perhaps the number of mitoses is the most conspicuous factor, but if one is going to make a diagnosis of sarcoma of the ovary, four things should be looked for: First, the normal stroma of the ovary should be demonstrated; second, the sarcoma cells; third, the intercellular substance which the sarcoma cell invariably lays down, and finally the blood vessels. So if one can distinguish those four it is fair to make a diagnosis of sarcoma of the ovary; but even then one is not dealing with a tumor which is of a malignancy to be compared with the epithelial growths. They are in a class by themselves, and I think that simple removal of the ovary, even if it is reported a sarcoma or fibrosarcoma, will result in the saving of the life of the patient.

There are some types of sarcoma, the very cellular ones of a very embryonal type, which may be more destructive than that, but, in general, they are not to be compared to the epithelial in the grade of malignancy.

As to the other forms of solid ovarian tumors I might say that they have a more academic interest than a practical one. Such forms I mean as the endothelioma. I see no reason why there might not be endothelioma of the ovary, although I have never seen one. I have seen endothelioma and angioma of the fallopian tube, strangely enough, for there have been only six cases of that type of tumor reported, but whether or not there has been actually demonstrated endothelioma of the ovary I am not prepared to say. If a tumor shows lymphangiomatous and hemangiomatous structures undoubtedly connected with the lymph and blood vessels and the cells lining those vessels, I think you can call them endothelioma of the ovary, but the forms of tumors of the ovary which sometimes have been termed endothelioma are epithelial and are simply termed endothelioma because they have a peculiar arrangement of the cells, perhaps in garlands, or perhaps in some type like the one Dr. Geist referred to, the folliculoma and the tendency has been perhaps to call those endothelioma. I think those have generally turned out to be epithelial tumors and the true endothelioma, if present, must be associated with the blood vessels or lymphatics, as I have said before.

The teratoma, the solid teratoma, or teratoblastomata, are surely very rare tumors, and they are undoubtedly very malignant because they are embryonal.

DR. ROBERT L. DICKINSON.—I desire to refer to the lack of sufficient clinical help to guide us in the practical handling of these cases, when the

abdomen is opened and a rare condition is found. It is all right with a patient at forty or forty-five, when most of these tumors occur, for at that age you can clear out the pelvis if you are in doubt, but in the case of the young girl to whom Dr. Bishop referred in opening his paper, one is in grave doubt at times whether to do a radical operation or not. It is to be deplored, that we have not had from the pathologists instruction to us clinicians who began too early to be pathologists, in order to know when you get solid tumor in your hand what to do with it by macroscopic and swift pathologic examination. If you take it out, and nothing else, when in doubt, you may have done extensive cancer cell implantation in clamping or taking it away and making raw surfaces.

I would like to say that in the case of the girl to which Dr. Bishop referred the tumor looked like a fibroid. It extended to the navel and filled the pelvis and the question there was, should we condemn that young girl to the menopause and childlessness? To some of the onlookers it did suggest a fibroid. It was, as you see, an unusual growth and history. The other ovary was affected. I cleared out her pelvis to the pelvic walls, leaving only a shell of cervix. She has gone fourteen months without recurrence.

DR. LEROY BROUN.—I think we have to deal with these cases clinically as they are presented to us. Where you open the abdomen and find a solid tumor of the ovary without adhesions, if the other ovary apparently is normal, the temptation is to remove that ovary alone without doing a complete ablation on the basis of the possibility of a fibroid. The pathologists tell us that if it is malignant we should remove the entire pelvic contents. On the other hand, I think many of us have had cases where recurrences have not taken place. I have one instance, of a patient on whom I operated twelve years ago for a solid tumor of the ovary without any adhesions. The impression produced was that it was a fibroid solid tumor. The report came back carcinoma of the ovary. I was much disturbed, but the patient was in her bed and, in fact, nothing more could be done. I heard from her one year ago and found her absolutely well.

Where there are extensive adhesions with free fluid and the other ovary is involved, or appears to be involved, unquestionably I think we should do a total ablation and make no attempt at conservation.

DR. HERMANN GRAD.—In one month I have had two cases of malignant ovarian tumors. One was very solid, and the other partly solid and partly cystic, so that it seems to me that they occur quite frequently, and, as Dr. Dickinson has pointed out, the great point with the clinician is what to do with the young woman. I had a case just a year ago this month at the hospital in a woman twenty years of age with an enormous ascites and a malignant ovarian tumor which was so friable that we had to remove it in pieces. I looked at the other ovary and it appeared absolutely normal to me except in one place and that place might have been a corpus luteum cyst. Nevertheless, I was so impressed with what the pathologists tell us that I exseeted this portion of the ovary that looked to be somewhat affected and left a tiny piece of ovarian tissue on the uteroovarian ligament. That woman had a very stormy recovery. She got an empyema and was in the hospital five months, but she is perfectly well now and is menstruating normally for the past seven months.

In many of these cases the question comes up of clearing out the pelvis, but the patients are not in condition to withstand such an extensive operation. I have a case in the hospital now with an enormous malignancy. That patient could not stand a radical operation. I was glad to be able to remove the tumor that she had and close the abdomen.

DR. W. P. HEALY.—Some years ago at Fordham Hospital I operated on a woman about thirty-five years of age, who had an annular carcinoma of the small gut, about four inches from the duodenojejunal angle. I made a very careful palpation of both ovaries at the time of the resection of the bowel and was quite satisfied that there was no evidence of involvement of either ovary. The woman made a very satisfactory recovery from the operation, but about a year later when Dr. Broun had this patient under his supervision in the Woman's Hospital, the lower abdomen and pelvis were filled with a fairly solid neoplastic mass and he was considering doing an exploratory celiotomy. He found that the lesion was now inoperable—carcinoma of both ovaries. In other words, what I want to bring out is this point: it is an exceedingly difficult thing to tell by palpation, and sometimes probably by inspection, whether an ovary has already had carcinoma engrafted in a follicle from peritoneal invasion, either from a neoplasm of the opposite ovary or elsewhere. This experience inclines me to endorse Dr. Bishop's point of view that, if cancer or something that appears to be cancer is present in one ovary, the treatment of the case should include the removal of the opposite ovary and uterus.

The second point I want to speak about is the question of irradiation of these solid ovarian tumors. A few months ago we had referred to us at the Memorial Hospital a young girl, sixteen years of age, who had an exploratory celiotomy in another hospital, done by a good surgeon, who had removed a solid tumor of the right ovary which was reported by his pathologist to be a sarcoma. This tumor recurred very promptly. Then she was referred to us. She had a large tense cystic smooth tumor filling the lower abdomen, extending up to the umbilicus, but chiefly right-sided. The abdomen was bulging and distended on that side. She looked quite ill and was having a good deal of pain. We subjected that tumor and the lower abdomen and pelvis to high voltage x-ray treatment. She was given a fifty-minute exposure twice. The tumor increased very rapidly in size after the treatment, likewise the pain. I was of the opinion when I first saw her, that the tumor could probably be removed surgically again and suggested that before attempting this, irradiation be carried out, with the idea of trying first to "knock out" the tumor cells by irradiation. I operated a few weeks later and removed the entire tumor mass, which was definitely encapsulated, but, nevertheless, universally adherent to the parietal peritoneum back of the broad ligament on the right side, and the bowel adherent all about. The left ovary was apparently normal in the gross. We felt we had possibly done something that was going to be worth while for that little girl. She made a nice convalescence and went home from the hospital fairly soon, but came back promptly in a few weeks with apparently the same tumor, that is, in size, the lower abdomen again filling up very rapidly with a solid mass. The pathologist's report was an embryonal cell type of tumor, very highly malignant, the histogenesis obscure. The tumor was a mushy, yellowish-gray mass except for its capsule. There still were viable tumor cells in the structures which had become adherent to it, and they are so highly malignant that if recurrence occurs even irradiation does not seem to touch it.

DR. S. H. GEIST.—Referring to the case reported by Dr. Gordon, I think that when one is dealing with a bilateral ovarian tumor, irrespective of what his opinion may be, one should remove uterus, tubes and ovaries. In view of the fact that bilateral ovarian tumors in more than 50 per cent of the cases are secondary to malignant neoplasms in other organs of the abdominal cavity, it is well worth while taking the time, irrespective of personal opinions to make a thorough exploration to determine whether it is primary or a metastasis. Bilateral tumors practically always mean malignancy; only about 15 per cent of them are benign.

There was one very important point that Dr. Dickinson brought up. He said "some of us were too old to take up the study of pathology." I do not think that is so. I think every man doing pelvic surgery, after he has removed a tumor and gets a report, whether it be malignant or benign, should take the trouble to go to the laboratory and see that tumor and study it under the direct supervision of the pathologist so that the next time he meets with such a tumor he will have some indication as to what to do.

There is no question but that malignant tumors of the ovary can be diagnosed grossly at the time of operation. Certainly solid epithelial tumors and the malignant stromatogenous unripe, round-celled sarcoma forms can also be diagnosed at the time of operation, and in that statement I think Dr. Strong will agree with me. If you are in doubt, it should be treated as though it were malignant. That makes the indication for operation very definite in that type of tumor.

In cases where there are bilateral tumors of epithelial origin, a complete operation is indicated. In a question of doubt as to their malignant nature in epithelial tumors it is wiser to do a complete operation. In bilateral tumors of the stromatogenous variety in a question of doubt a conservative operation may be attempted as borderline stromatogenous tumors give a good prognosis with a conservative operation. I prefer complete operation in all bilateral solid tumors.

After the patient is operated upon conservatively and a report of a malignant tumor is returned, one may with perfect safety reoperate the patient and do a complete removal, because, as shown by some very interesting experiments on rat carcinoma carried on by Dr. Francis C. Wood, local excisions or partial removals do not increase the danger from metastases or recurrences if a complete secondary operation is performed within ten to fourteen days.

OBSTETRICAL SOCIETY OF PHILADELPHIA

MEETING OF NOVEMBER 1, 1923

DR. WILLIAM E. PARKE IN THE CHAIR

DR. JOHN G. CLARK AND DR. FRANK B. BLOCK presented a paper entitled **Relative Values of Irradiation and Radical Hysterectomy for Cancer of the Cervix.** (For original article see page 543.)

DR. CHARLES C. NORRIS AND DR. M. E. VOGT (by invitation) contributed a paper entitled **Carcinoma of the Fundus of the Uterus, with a Review of 115 Cases.** (For original article see page 550.)

DISCUSSION

DR. W. R. NICHOLSON.—There should be no question, it seems to me, that all competent gynecologists will agree that radical operation for carcinoma of the cervix is a thing of the past. I am happy to say that for the past four years I have not done a so-called radical operation for cervical carcinoma. Some years ago I did use the Percy cautery, but after half a dozen cases, was convinced of the futility of the procedure. Since that time I have used the same instrument as a preliminary step to the use of radium, but I have come to the conclusion that aside from the removal of the sloughing mass, for the introduction of radium, there is no indication even here for operative procedure.

I personally believe that when one can diagnose carcinoma of the cervix, by either inspection or palpation, the case is beyond operation. I do not believe that the presence or absence of demonstrable areas of extension should enter into the question of operability. I believe that the Wertheim operation, done according to the published technic of its author, has failed to increase the span of life of those suffering from carcinoma of the cervix. By this I mean that the primary mortality and immediate secondary mortality is so high that the number of days of life lost by the women who have been operated upon, are greatly in excess of the number of days of life gained by the so-called successful cases. In other words, I feel perfectly hopeless regarding the operative treatment for carcinoma of the cervix, and believe that at present we can only hope that radium and deep x-ray treatment will offer some chance for these patients.

With regard to carcinoma of the fundus, I, of course, have a very different feeling. If I had to elect a site for carcinoma in a woman, I would most certainly choose the fundal portion of the uterine cavity. My experience has been that if the patient is seen within a few months of her first symptoms she has a very good chance of complete cure by an ordinary panhysterectomy. Of course the use of deep x-ray has to be considered in certain of these cases; as for instance a woman upon whom I operated three years ago, and in whom the extension of the disease was more widespread than I had expected. In this case I am certain that a small portion of the cervix was of necessity left *in situ*. The repeated use of x-ray and radium, by Dr. Pfahler, has resulted in the complete disappearance of anything which can be considered pathologic as far as the vaginal examination is able to reveal.

On the other hand, I have within the last few days advised against, or rather, acquiesced in the decision of a patient against hysterectomy, because the carcinomatous condition of the fundus was of three years' standing, and because the feel of the uterus impressed me with the belief that there was beginning peritoneal extension. She will have x-ray and radium.

I wish that Dr. Norris had been a little more definite in stating how he differentiates cases suitable for panhysterectomy, and I hope that when he publishes his paper, this point will be fully covered. There is one thing in his paper which to my mind, from the standpoint of cure, is more important than anything else and that is the question of bleeding at the time of the menopause. If it could be impressed upon all women that at the time of the menopause, any increase of bleeding is a danger sign, and that its occurrence means that a most thorough examination should be made by a competent gynecologist, with a uterine curettage if necessary, there is no question that we would see a tremendous improvement in the higher grades of the common schools, and by a nation-wide propaganda, upon all women, irrespective of age, there is no question that the statistics of cervical carcinoma could be improved beyond anything for which we can hope at the present time.

It has always seemed to me to be extremely unfortunate that women are not instructed as to what constitutes menstruation, in order that they might know that a mere discharge of blood from the genitalia is not necessarily a menstrual period. Unfortunately, otherwise intelligent women have absolutely no conception of what menstruation really is, and as is well known, there is a firmly entrenched belief that the menopause is usually ushered in by hemorrhages. Of course the difficulty is that in a good many instances benign hemorrhage does occur as a symptom. I believe that if it would be possible, by the teaching of physiology

in the higher grades of the common schools, and by a nation-wide propaganda, to enforce this one fact upon the women of America, we would see a tremendous improvement in the cancer mortality in the next twenty-five years.

Finally, I would simply mention the only adverse criticism of these two papers, which is the advice to use the sound in the office as a diagnostic means of detecting the possible presence of fundal carcinoma. It is all very well to have trained men, under the stringent precautions outlined by Dr. Norris, use this procedure, but I think it a grave mistake to advocate its use by the profession at large, as the ordinary nonoperating practitioner has absolutely no knowledge of what constitutes asepsis.

DR. HOWARD A. KELLY, of Baltimore (by invitation), spoke on **Cauterization of the Uterine Cervix.**

I am happy to return to my ancestral society after an absence of about thirty-five years. I made one visit to the College when this radium question was just being opened up and I was, I felt, somewhat discredited at that time judging by the reports in various papers, but after all, all my claims for radium have in time been fully substantiated, for radium is used in the clinic of every large hospital.

The cervix uteri is the source of all the stringy, glutinous, sticky leucorrheas, which are a source of distress and sometimes of obvious ill health to so many woman. While, as regards treatment, these lesions of the cervix are regarded as minor gynecology, I believe that they are often gonorrheal in nature and, if superadded to a lacerated cervix, are a common precursor of cancer of the cervix. If these etiologic data are correct, then this simple annoying ailment at once assumes major importance.

I desire to speak particularly of their cure. Under local topical applications, douches, paintings and packs, such as our immediate predecessors used, they never got well but haunted the consulting room of the gynecologist from year to year. The one method of treatment is that urged by Guy L. Hunner, namely, the use of the actual cautery. It is my custom to do nothing else but insist on a prompt treatment and thorough cauterization of the whole exposed diseased surface of the swollen cervix, with its cysts and its everted mucosa pouring its secretions out from such glands as are not obstructed and cystic. This can often be done without pain and without anesthesia. If the operator prefers, it can be done with from three to six linear cauterizing cuts well down into the disease, to be repeated in from four to six weeks at two or three intervals. I do not hesitate to make a deep, thorough cauterization. The effect of this is to shrink the cervix, cause the mucosa to draw back into place and to stop the tenacious, ropy discharge.

I never do this as a step in a plastic operation restoring the vaginal outlet, as the suppuration follows so quickly, the wound below would be in great danger of infection.

With this procedure available, I but rarely operate any more for laceration of the cervix, for unless such a laceration is very deep, it needs no attention in the absence of any infection of the glands and when the infection is there, the cauterization takes care of it perfectly.

This is a little-big matter, too apt to be neglected in these days when we so constantly prefer to discuss the problems of major abdominal surgery.

DISCUSSION

DR. STEPHEN E. TRACY.—I would like to ask Dr. Kelly if he ever uses radium in bad cases of leucorrhea.

DR. DANIEL LONGAKER.—There is nothing that I have learned in my entire career that has given as much satisfaction as the plan of treatment of these cases Dr. Kelly has outlined. I have, however, not used the large cautery knife, but the smaller cautery point. One can do this with the greatest satisfaction in the great majority of cases in the office. Commencing at the internal os, outward in a linear direction one cauterizes down to healthy tissue.

DR. CHARLES C. NORRIS.—I would like to ask Dr. Kelly if he draws any distinction between the cases of leucorrhea which are plainly of gonococcal origin and those the result of laceration. The pathologic lesion in these two conditions is quite different. The important thing is to recognize that in both these types, the organ of the discharge is the cervix, and that intrauterine medication or curettage is meddlesome and harmful. In the variety due to laceration, much depends upon the degree of the tear; many of these respond well to office treatment, whereas the more severe grades require a repair. In the milder grades of laceration, the cautery produces excellent results. I believe, however, that neither cauterization nor radium is entirely free of danger in the gonococcal class. In any event, the integrity of the internal os should be carefully maintained.

DR. JOHN M. FISHER.—The way I usually treat these cases of neisserian infection in nulliparous women and which I find highly satisfactory, is as follows: Place the patient under the influence of an anesthetic, preferably gas, then give the vagina and vulvar structures a thorough mechanical scrubbing with soap and water, fix the cervix with a tenaculum forceps, dilate the cervical canal to the internal os with bougies, cleanse with absorbent cotton, then remove the tenaculum forceps, introduce a Ferguson's cylindrical speculum, pour in a solution of nitrate of silver, (35 grains to the ounce) allowing the cervix to be bathed in this solution for a period of two to four minutes. A forceps armed with a large wad of cotton or gauze is then introduced into the vagina, and the speculum drawn over the forceps so as to make thorough application of the silver solution to the whole mucous membrane of the vagina. The silver solution is also applied to all of the vulvar structures and to the urethra. Normal salt solution is then poured into the vagina to neutralize the excess of silver and this is followed with a tampon of lamb's wool, as much as the vagina will hold, covered with lanoline 75 per cent, ichthyol 25 per cent. Upon the withdrawal of this twenty-four hours later, the vaginal mucosa usually presents a pale pink hue. In very many cases I have found the discharge arrested, extending over a considerable period and in some cases it never returns. I consider this one of the best forms of treatment in cases of chronic neisserian infection of the cervical canal and vagina. When necessary it may be followed by other forms of treatment.

DR. HOWARD A. KELLY (closing).—I have seen patients with leucorrhea cured by radium but I have become so wedded to the simple methods outlined tonight that I have stuck to them. For twenty years I have used nitrate of silver from 5 per cent up to 20 per cent, especially for vaginitis, but not for cervical disease. It does often literally wipe out the disease of the lower tract. The trouble in the cervix is so much deeper that I do not believe it can be reached by this means. In using the large red hot platinum point I am not afraid of overcicatrization. I have never seen it and normal labor in cases of subsequent preg-

nancy proves its safety. I would not like to cauterize extensively up in the cervical canal; fortunately the everted and exposed surfaces on that are the parts mainly effected and needing treatment. This method is also one of our important ways of curing sterility by purging the uterine inlet of the infected plugs of mucopurulent material. I am obliged to Dr. Noble for the clear way in which he states the more deliberate methods of our predecessors, but our predecessors did not have to deal with people who came in the morning after traveling two or three hundred miles by train and who were at once in a hurry to go back the same night. I have a group whom I call my telephone booth patients, those who call me up with, "I want my treatment in order to catch the next train." I ask them, "Why didn't you tell me? I would then have met you in the railroad telephone booth and have inserted the radium and you could have caught the very next train." Some interpret the facetiousness seriously. It is just a little vexatious to have such an important thing as life and health handled so casually. Dr. Norris, I fail in the differentiation of neisserian from other causes of this infection. I have classed them all into as probably neisserian and treated all alike. I do not believe any other than the treatment outlined will cure this disease,—all honor to Hunner's perspicacity. I rarely operate any more for laceration of the cervix.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

ESSENTIALS IN ROENTGENTHERAPY OF INTEREST TO CLINICIANS; WITH A CONSIDERATION OF ITS APPLICATION IN GYNECOLOGY

BY M. R. ROBINSON, M.D., F.A.C.S., NEW YORK

Adjunct Gynecologist to Beth Israel Hospital, Attending Gynecologist to Beth Moses Hospital

(Continued from April issue)

III. ROENTGENTHERAPY IN GYNECOLOGY

The main gynecic affections in which roentgen rays are employed with varied degrees of success are: (A) ovarian dysfunction; (B) uterine myomata; (C) sarcoma uteri; and (D) carcinoma uteri.

A. Dysmenorrhea and metrorrhagia of the oophorogenic type, can be stopped with an x-ray dose sufficient to destroy the function of the graafian follicles. Before resorting to this plan of treatment, it is our duty to inform the patient that with the cessation of her excessive or irregular uterine bleeding, her function of ovulation will also be sacrificed. Although some authorities claim to be able to so regulate their dosage as to entail only a temporary loss of menstruation and fecundity it is, nevertheless, advisable not to submit young individuals, or those desiring to preserve their procreative potentialities, to this form of treatment, unless coexisting diseases, such as advanced cardiac, renal, or pulmonary affections make the adoption of this procedure imperative. Early gestation also forms a definite contraindication to the irradiation of the genitalia as it may exercise a deleterious effect upon embryonic development. It happens at times that the uterine bleeding, particularly the preclimacteric menorrhagia, will be more excessive, immediately following the course of x-ray treatment for one or more periods, and the patient will naturally be greatly discouraged and doubt the value of our therapeutic agent. This just criticism may be obviated if the irradiation is administered at the most propitious time in the menstrual cycle. It is now a well established physiologic fact, that the follicle and the corpus luteum are the two antagonistic forces which respectively stimulate and inhibit uterine bleeding. The graafian follicle dominates during the first half of the estrum and under its hormonic influences the uterus is preparing itself for the next pregnancy or men-

struation. The moment the ovum fails to became fecundated and dies, menstruation sets in, and immediately the corpus luteum gains in ascendency, and as soon as it reaches its full development the bleeding ceases. Hence it is clear that if the treatment is given during the first two weeks of the menstrual period, the follicular activity will be suspended and the next uterine flow will be suppressed. On the other hand, if the irradiation is undertaken when the corpus luteum occupies the functional stage, not only will the next ripening follicle not be effected, but the existing inhibitory influences will also be curtailed, and the next uterine bleeding will be hastened and increased. But even in cases in which the proper time for the irradiation has not been chosen, a delayed success will follow, and only in rare cases may a second course of treatment become necessary. We may, therefore, state with definiteness and positiveness that functional uterine bleeding is curable with deep roentgentherapy and should no longer be subjected to surgical procedures. Besides the avoidance of the primary mortality of one to three per cent, which hysterectomy entails in the most skillful hands, this form of treatment is also free from morbidity, and the psychic effects which follow this form of artificially induced menopause are far milder than those resulting from total hysterectomy. This last advantage is gained from having left the ovaries *in situ* in which the interstitial glands, the most refractive tissue in the ovarian parenchyma to x-ray, remains undisturbed, thus minimizing the ensuing vasomotor disturbances and preserving the libidio sexualis for a much longer time.

B. The myomata which cause profuse regular and irregular uterine bleeding are the interstitial and the submucous types. The bleeding resulting from the former class can be controlled and the tumors themselves can be reduced in size, and at times also made to disappear, through the irradiation of the ovaries. This form of bleeding may, therefore, be considered as oophorogenic in contradistinction to the submucous variety, which is uterogenic in character and upon which ovarian castration has not only no effect but aggravates the bleeding. The reason proffered for this condition is that with the shrinkage of the uterus pursuant to ovarian radiation a constantly increasing hindrance to the return circulation in the tumor develops and the bleeding grows worse. This theory has been clinically substantiated and such fibroids, under the persistent and continuous diminution of the uterine volume, have in time become extruded so that they appeared at the external os. Only through their surgical removal did the bleeding finally stop. Our greatest therapeutic successes with fibroids are accomplished with the interstitial type, when the tumors do not exceed the size of a three or four months' gravid uterus. As soon, however, as the tumor reaches greater dimensions the anatomic position of the ovaries becomes distorted, and the direction of the x-rays becomes a matter of hit or miss. Many of these tumors, due to their size, also give rise to pressure symptoms and must hence be classified among those amenable to surgical treatment. The subserous pedunculated fibroids rarely cause bleeding and call for no treatment, excepting when they give rise to subjective symptoms on account of their excessive size or when twisting of the pedicle occurs, then they too become surgical cases.

In undertaking, therefore, the treatment of uterine fibroids by

means of x-ray, a correct diagnosis is essential. We must first establish the size and kind of fibroid; we must exclude the very large tumors which cause pressure disturbances; we must ascertain that there are no intrauterine fibroids; that the tumors are not in a state of necrosis and degeneration; that there are no concomitant inflammatory processes in the uterine adnexa; and last but not least, to exclude the possibility of a malignant condition. In view of these pertinent facts, it is absurd to permit ourselves to be misguided by the promiscuous statements of some ill informed x-ray therapists, that in the leading European clinics the surgical treatment of fibroids is a thing of the past. What we may state with authority and truth is, that the number of hysterectomies for fibroids in the German clinics in particular, has been greatly reduced when compared to ours. This is due to the fact that the moderate sized tumors of the interstitial type, which constitute the largest percentage of benign uterine neoplasia, are all, with very few exceptions, treated with success by deep roentgentherapy. We may hope that with an increasing knowledge of the efficacy of roentgentherapy in this country, and with a growing consciousness that our patients are entitled to a form of treatment which renders no mortality and no morbidity, that the number of hysterectomies for interstitial fibroids performed here will also reach a very low level.

C. Sarcoma of the uterus affects the body much more frequently than the cervix or the portio vaginalis. Its seat of greatest predilection is the uterine wall, the center of myomatous or fibromyomatous tumors, and lastly the mucous membrane. A diagnostic curettage will, therefore, be of value in but a limited number of cases, for to obtain a section from the uterine wall, or of the tumor, would entail an attempt equal in magnitude and seriousness to a hysterectomy. This has caused Seitz and Wintz to adopt clinical diagnostic guides, such as the rapid growth of the tumor, and its correspondingly rapid diminution in the size after irradiation, as positive signs of uterine sarcoma. An x-ray dose equivalent to 75 per cent of the skin erythema dose will suffice to destroy sarcomatous tissue and stop its further growth. Due to the fact that sarcoma metastasizes very slowly, radiotherapy renders far more gratifying results in this affection than it does in carcinoma.

D. Carcinoma Uteri.—The appalling toll in diseases and death which womankind in particular is paying annually to the Moloch cancer demands that we render an unbiased accounting of the present therapeutic status. A brief historical review of the treatment of uterine cancer, for the past fifty years, will greatly illucidate why our methods of procedure have undergone such wide oscillations from time to time and why the therapeutic pendulum is still vibrating.

Accepting the teaching of Virchow that cancer is primarily a local disease, surgeons have directed their efforts to limited resections of the cancerously affected organ or tissue. Subsequent clinical results have proved this procedure to be inadequate, and further pathologic studies have shown that the earliest clinically recognizable cancer is no longer a strictly local affection, but one in whose mediate and immediate vicinity cancer nests are already present.

Wider excisions, therefore, became the surgical slogan, and the era of the radical abdominal operation was ushered in on January

30, 1878, by Wilhelm Alexander Freund, who performed the first extensive abdominal hysterectomy for cancer of the uterus. The primary mortality from shock, sepsis and injury to the ureters, which accompanied this operation, was so frightful, that within less than seven months after Freund's operation saw the light of day, it was abandoned by most surgeons.

On August 12, 1878, Czerny extirpated a cancerous uterus *per vaginam*, and his method soon found favor with the profession on account of its greatly diminished primary mortality. Czerny's original operation soon underwent many modifications. Schuchard's procedure has greatly facilitated a wider approach to the pelvic connective tissue, but none of these operative innovations sufficed to reduce the high percentage of recurrences, or to lengthen the period of curability. In spite of these lamentable shortcomings the vaginal method held sway for nearly twenty years.

In 1897 Wertheim revived and revised the teachings of Freund to which he had added definite and epoch-making contributions, such as the isolation of the ureters, the removal of the pelvic lymph glands and the wider excision of the parametrium. Without intent to detract from Wertheim's meritorious service, it may be noted, that Ries and Clark in our own country, and Rumpf in Germany have anticipated him and carried out an almost similar operative technic in 1895. As time advanced and Wertheim's method gained in efficiency in his own hands, as well as in the hands of others, particularly in those of Franz, the radical abdominal route was universally adopted. The primary mortality was reduced to as low as 10 per cent, and the percentage of cures raised to 20 per cent.

Just about 1911 when the Wertheim operation had reached the zenith of its accomplishments, deep x-ray therapy was introduced. The freedom from primary mortality and the magic-like rapidity with which the cervical carcinomata would melt and disappear under the influence of roentgen rays caused the schools in Erlangen, Freiburg, Frankfurt and Berlin to acclaim deep x-ray therapy as the ideal method of treatment, to the exclusion of surgery.

Over a decade has now passed since surgery and deep radiotherapy vied with each other for supremacy in the treatment of uterine cancer, without a decisive victory for either procedure. Statistics emanating from equally reliable sources furnish equally gratifying results; and from a personal visit of some of these schools I am convinced that the personal equation of the head of each clinic greatly influences the method of procedure adopted. I am also convinced that in the very near future no sharp lines will be drawn between the operating and irradiating methods, and that patients will be treated not according to the method adopted by a given school, but according to the clinical indications in each individual case. Bumm, who has been an ardent and enthusiastic advocate of radiotherapy, has recently resumed surgical activities, for he claims that the durability of cures has been shortened through generalization, and that surgery in the properly selected cases does ultimately render the best results.

In the midst of these clinical vacillations from conservative to radical surgery, then from radical surgery to deep x-ray therapy, and now back again to surgery, where do we stand on the problem of uterine cancer? What method or methods are we to recommend to

our patients? Can we conscientiously exclude either method, and if not, how and when should they be employed?

In all operable cases surgery must take the first place; for by removing the cancer-bearing organ with as much of its surrounding tissue as is consistent with safety, we lessen the force and the number of the invading foe, and thus indirectly add to the potency of the organism's natural immunity and resistance. Furthermore, the trauma produced by the operative attack calls forth a local inflammatory reaction with a mobilization of leucocytes and lymphocytes, which, according to Teilhaber,[7] establish a local immunity of one to two years' duration. The operative procedure also calls forth a constitutional reaction which stimulates the hematolymphocytic centers to increased activity and thus raises the general resistance. If in addition to the operative advantages we also add x-ray therapy in doses which will still further weaken the cancer cells left behind, and at the same time stimulate the healthy tissue to a higher degree of cellular immunity, we have accomplished all that modern scientific medicine is capable of.

Inoperable uterine cancer should be submitted to x-ray therapy in combination with radium or alone, according to the case and the experience of the therapist. Through this treatment an intolerable, loathsome disease is made sufferable, the bleeding and the offensive irritating discharges are lessened or stopped, the general condition improves, and life may be prolonged from one to three years. Some of these cases may even become good operative risks.

Borderline cases should be irradiated first. The advantages claimed for preoperative irradiation are that the virulence of the bacteria which infest the necrotic cancerous tissue are destroyed, thus lessening the danger of postoperative sepsis and the reduction of the tumor mass renders the operation easier. The objection raised by some surgeons to preoperative irradiation is that the operative steps are made difficult through the formation of an excess of connective tissue in the parametrium. This difficulty can be surmounted if the interval between irradiation and operation is not prolonged beyond a period of two to three weeks. Furthermore, the slightly increased operative difficulty, caused by the preliminary irradiation, is more than compensated for by the lessened bleeding encountered at the time of operation.

Of the other potentially malignant, or positively malignant affections of the uterus, in which x-ray therapy may and should be employed postoperatively, either prophylactically or curatively, are hydatidiform mole and chorioepithelioma.

Tuberculosis of the uterine adnexa, with or without associated pelvic and abdominal peritoneal involvement, renders the most gratifying results from x-ray therapy. A positive diagnosis is unconditionally required before the roentgen treatment is instituted, even if an exploratory laparotomy should become necessary in order to establish it.

Other bacterial diseases of the genitalia are thus far excluded from this form of therapy by experienced clinicians.

Married women who, on account of cardiac, renal, or pulmonary affection, must forego the blessings of maternity, can be rendered sterile by x-ray therapy, and thus be spared even the minimum risk

which the most skillful operation may entail in such cases, and not be deprived altogether of their matrimonial bliss. There is also a group of psychic and sexual disorders in which ovarian castration may form a vital indication, but great care and mature clinical judgment must be exercised in their selection. Metabolic disorders, particularly those of calcium, over which the ovary and the thyroid exercise a marked influence as well as disturbances of other endocrines are gradually coming under the sway of the roentgentherapeutist; further investigations will decide whether we are on the right path.

Some roentgentherapists continue to differentiate between x-ray sterilization and castration. As a matter of fact all ovarian irradiations are practical castrations, and the exception only proves the rule. This fact has induced some investigators to resort to extragenital irradiation of those endocrines which are antagonistically related to the ovary, and thus indirectly inhibit temporarily the hyperfunctions of the germinal gland. Stephan made an attempt to control uterine bleeding of oophorogenic origin through the irradiation of the spleen, which increases the coagulability of the blood. I have had a chance to observe the application of this principle in the Seitz clinic, and may state that the effects were so evanescent that direct ovarian radiation had finally to be instituted. Other clinicians claim to have obtained favorable results from irradiation of the hypophysis and the bone marrow, in cases of uterine bleeding, of ovarian or hemic origin. The question of extragenital irradiation for the purpose of influencing genital disorders must, for the present, be left open; it has been mentioned in order to show how the scope of roentgentherapy may be widened, and what potentialities still harbor within these unknown electrophysical forces, x-rays.

RESUMÉ

1. The problem of radiotherapy will not be completely solved until the biologic factors entering into this equation have been better understood and more directly controlled.

2. Individualization of cancer patients is of prime importance and for this reason surgery and radiotherapy must supplement each other, and change their rôles from predecessor to successor, from time to time, according to the mature judgment of the treating clinician.

3. The localistic conception of cancer must be modified, and malignant disease must in the light of recent advances be considered as a general affection characterized by a constitutional morphologic inferiority of some tissue.

4. The success of x-ray therapy in malignant disease is not wholly dependent upon the destruction of the tumor cells, but also, to a very large extent, upon the general cellular immunity of the organism, and upon a preservation and stimulation of the forces governing this immunity.

5. Surgery should be given first choice whenever possible. The removal of the main malignant focus and large metastatic deposits gives the economy a better chance to utilize its reserve of natural immunity in combating the remaining disorganized malignant stragglers, which must still be weakened by postoperative deep roentgentherapy.

6. The administration of deep x-ray therapy requires training and

preparation; the possession of an x-ray apparatus does not indicate therapeutic skill. From a gynecologic viewpoint, I may add that modern gynecology demands, besides a thorough preparation and mastery of surgical technic and a comprehensive understanding of the female patient in particular, also a knowledge of the main principles of radiotherapy.

7. Radiotherapy must be administered by, or under the direction and close supervision, of, the clinician, in order to obtain the best results.

8. It is quite possible that some of the present day views regarding cancer therapy by means of surgery, radium, or x-rays, will undergo many changes. One thing, however, is certain, that the x-rays as one of the most important weapons in combating deep seated malignant foci will never disappear from our medical armamentarium.

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1125 MADISON AVE. N. Y.

Errata

In the article by Dr. A. B. Davis, April, 1924, the first four lines at the top of page 375 should read:

"I have employed the double flap technic in three cases and have lost one mother and her child. This mother gave one of the most horrible exhibitions of septic poisoning which has ever come under our observation."

Detailed case reports will appear in Dr. Davis' reprints and likewise in the current volume of the Transactions of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons.